Pit and Quarry

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BELGIAN CEMENT IMPORTATIONS DROP

A SHARP decline in cement importations is indicated in the preliminary figures released by the Department of Commerce. Since Belgium furnishes about forty per cent of all foreign cement used in this country the report is exceedingly interesting. In July, 1927, 116,137 barrels of Belgium cement were shipped to the United States as against 277,233 barrels for the same month last year representing a decrease of 58 per cent.

For home consumption in Belgium the present mill price is about 175 to 180 francs or 89 to 91 cents. Prices have not been cut because the trade is in a flourishing condition. There was a price increase on July 1st of five cents per barrel and another five cent advance is promised in the near future. The demand exceeds the capacity by about 30 per cent. Profits for the first six months of 1927 are said to exceed the entire profits for the year 1926. Prices to the United States range from 89 to 91 cents per barrel f.o.b. Belgium mill and at the same time the delivered price in paper sacks in Holland is 94 cents. Railroad rates in Belgium are today 15 per cent lower than they were in 1913 and construction costs are about at the pre-war levels.

Price per barrel of four bags and destination of each of the thirteen shipments received from Belgium during July are as follows:

		C.I.F.
1.	Boston	$1.82
2.	Boston	1.82
3.	Philadelphia	1.90
4.	Miami	1.90
5.	San Francisco	2.05
6.	Grays Harbor	2.04
7.	New York	2.65
8.	San Juan, P. R.	2.13
9.	Honolulu, H. T.	3.25
10.	Honolulu, H. T.	2.20
		F.O.B.
11.	Belgian Mill	.816
12.	Belgian Mill	.88
13.	Belgian Mill	.926

Boston appears to have gotten Belgian cement at a lower figure than the other seven cities mentioned in the table. This recalls the break in the Boston cement market which occurred in July. The price to contractor, on the occasion refered to, dropped from $2.30 per barrel to $2 in one month. The August price of $2.05 per barrel reflected a slight improvement in the situation; this quotation still holds for carload lots, to contractor, f.o.b. Boston. Belgium, Norway and Denmark, together, furnished 95 per cent of all cement imports for July, 1927. Norway shipped 70,134 barrels or 40 per cent, and Denmark 19,971 barrels or 11 per cent.

RESEARCH IN STEEL PROVES ITSELF

FEW persons outside of the steel industry itself have sensed the importance of the research work that has been carried on during and since the War. Of outstanding importance is the discovery of the Hornsby-Wills granular iron process—a method of producing pig iron direct from ore without the use of a blast furnace. The method greatly lowers the cost of reducing the ore and produces an iron entirely free from carbon. The U. S. Steel Corporation is experimenting with the new process in a specially built plant at Loraine, Ohio.

A new Swedish development is the making of high-grade tool steel from sponge or granular iron instead of bars. In Japan the Kuji Iron Works claims to be profitably manufacturing iron from the iron-bearing beach sands found on the western coast of Japan.

One of these products has already attained considerable notice. We refer to the successful production of stainless iron and stainless steel. The usefulness of this alloy extends far beyond kitchen ware to marine hardware, which is perhaps its most promising field of application. It has been used in the making of life-boats and fast power boats. If it could be produced cheaply enough, stainless iron or steel would find an enormous field in ship construction. Red lead or other protection from corrosion would become unnecessary. The long distance view shows that the ultimate outcome of these developments cannot fail to be a wider range of uses for steel products, and probably their production at a lower cost.

THE BUSINESS TREND SINCE 1921

By Julius Klein

AMERICAN business is justly proud of the fact that it has left as monuments of its progress since 1921 a long succession of junk heaps of discarded processes, antiquated ideas, and obsolete poliices. There have been, it is true, some tragic instances of those who have clung too long to revered and once profitable practices and have consequently seen the march of progress roll far ahead of them. We still hear suggestions and hopes of reverting to the old-time methods and restoring "pre-war normalcy," but it is being more and more widely appreciated that such retrogression would be about as simple as an attempt to return to the middle ages—and just about as profitable.

There can be no doubt that our recent commercial progress and present momentum has been due largely to the disposal of the incumbrances which were discarded along the way as business has climbed out of the post-war pit. Not the least among these abandoned "antiques" have been the old devotion to excesive business secrecy, the fear of losing some small temporary advantage by adopting the "new fangled notions" of simplified practice. The suspicion that statistics and efficiency programs are "academic" and the contempt for associated effort.

But by this endorsement of the abandonment of time-worn incumbrances, I would not for a moment imply that all consideration of the past is futile. In fact, our business community is deserving of ample credit for its increasing interest in retrospection. The best evidence of this is the prevalence of the study of trends and curves of the trade experiences of recent years. Your forward-looking business man is no longer ashamed of being caught in the act of an occasional backward glimpse—not longingly, but with inquisitive intelligence. He is no longer operating simply from day to day, and from "hunch to hunch." Index numbers and carefully plotted charts are no longer academic mysteries to him; he strides fearlessly through the labyrinths of statistical tables that are spread across his path by alert editors, uplifting bank vice presidents, and zealous government experts. He knows where he is going and he is on his way, partly because he knows whence he came—and how. And so it would seem that a backward glance down the slope which we have been ascending might be profitable at this time, since we have reached a plateau after the long upward pull and are getting our breath, so to speak, for further intensive efforts.

The curves for the majority of business indicators have traced an encouraging upward path since 1921. There has been no serious downward dips in spite of frequent prophecies, especially during the last three years, that we were on the edge of another much feared chasm. Now this sounds like the steady progress of sustained prosperity and indeed it has been that, even though the number of commercial failures in 1926 exceeded those of 1921 by nearly ten per cent. Using 1919 as a basic one hundred, the production index for manufacturing in 1921 was 81 and by 1926 it had risen to 128; for minerals it was 93 in 1921 and 142 in 1926; for railroad ton mileage it was 87 in 1921 and 123 in 1926; for department store sales it was 110 in 1921 and 136 in 1926; and for mail-order-house sales it was 72 in 1921 and 123 in 1926.

One factor in this remarkable record should be borne in mind: A busy business is not necessarily a prosperous one, at least for the employer, owner, and those dependent upon them in financial and other interested circles. High gross receipts and high profits are not always synonymous.

A leading line in the machinery industry recently showed a net turnover amounting to fourteen million dollars a year but a check-up of the ten companies in that line indicated total profits of only $130,000. The wage earners in this industry and the tradesmen supplying their wants were naturally prosperous but evidently so far as its stockholders were concerned the industry was really "much ado about nothing."

As long as the ultimate purpose of business is profit, just so long is it necessary to be certain that the rumble of the busy machinery is not due to slack belts and loose cogs and that its operation yields something more than noise.

I ventured the opinion sometime ago that in several of our older industrial establishments there are still too many "Aunt Sarahs." She was the good lady, you will recall, who inherited a shoe factory and insisted that the plant continue to turn out high button shoes because "Uncle Ezra" had made it pay with that line in the seventies. Nearly forty-four per cent of the machinery in one import industrial group is more than ten years old, which in these days of strenuous competition and constant change threatens to get pretty close to the border line of industrial senility.

Modern business, and especially American business, was never more dynamic and volatile than it is today. Deductions based upon its position last year are by no means necessarily valid now. With such a constantly changing front, it is doubly important that our strategy should be based upon a most effective intelligence service. One of the outstanding reasons for such succeses as have been achieved during the past six years by American industry and commerce is the highly effective contact which has been maintained with this front, the constant check that has been kept upon operations by the vigilant services of our trade papers.

ATLAS PORTLAND CEMENT COMPANY OPERATING LARGE WELL BALANCED PLANT

By George Ransom

ONE of the largest single unit cement plants in the country is owned by The Atlas Portland Cement Company and is located at Hudson, New York, about 30 miles south of Albany. The production amounts to 7,500 barrels per day. There are several remarkable things about this plant in addition to its size. The property covers some 1,600 acres including farms and orchards—three quarries—the immense cement making plant; and also additional cement storage; bagging and water and rail shipping facilities on the shore of the Hudson River.

Many of the men operating this plant including department heads and foremen have been with the company a great many years, in fact since the plant was started. The labor turnover is very low indeed in all branches of the service, and some of the reasons for this will become apparent as we progress through the various departments.

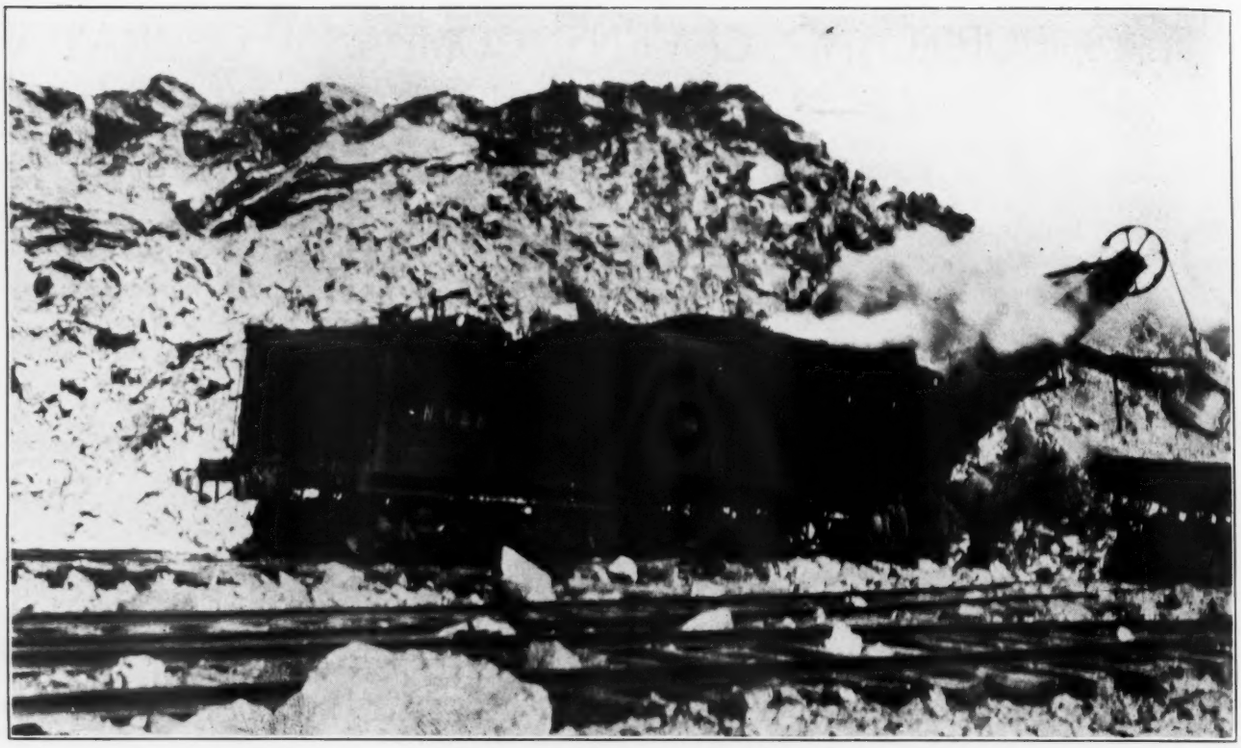
Quarries

Let us begin by visiting the quarries. The company's quarries are located on what is known as Becraft Mountain. Becraft Mountain has been known to geologists since the early days of geologic study in the state of New York, and descriptions of it play an important part in the early reports of geology of the State. It is famous for its remarkable stratification, and paleontologists have made an exhaustive study of the fossils found in it. The cement company owns nearly all of this mountain, and, its stone resources, therefore, are practically unlimited. Most of the stone quarried is taken from what is known as the Becraft stage. The thickness of this strata is 40 to 45 feet. There is very little overburden in this quarry. On an average about 10 per cent of shale is used in the mix which is quarried from the same mountain. At the present time there are two limestone quarries in operation. One of them was opened only last summer. The other covers considerable acreage and is actually the result of several workings which were joined together as time went on.

Drilling is done by Sanderson Cyclone drills with four inch tools. The holes are drilled 25 feet back from the face and generally about 14 feet apart and to a depth of 3 feet below the floor of the quarry. Jack hammers are used for secondary or block hole drilling. The greatest height of the face at any point is now 85 feet but this is considerably less at other points. Blasting is by means of 60 per cent gelatine dynamite in the bottom of the hole, 50 per cent Red Cross Extra in the mid-depth and 40 per cent Red Cross Extra at the top. The cartridges are 4 by 8 inches. For secondary blasting the explosive is in the form of 1 by 8 inch cartridges of 40 per cent Red Cross Extra dynamite. Two and one-half yard steam shovels are used for loading the quarry cars. There are two of these operating in the large quarry and one in the new, and in addition a ¾ yard shovel is used for stripping and clearing up the floor of the quarry.

A very interesting and practical arrangement has been made with respect to these shovels which has greatly helped in their efficient operation. This

The Atlas Cement Mill

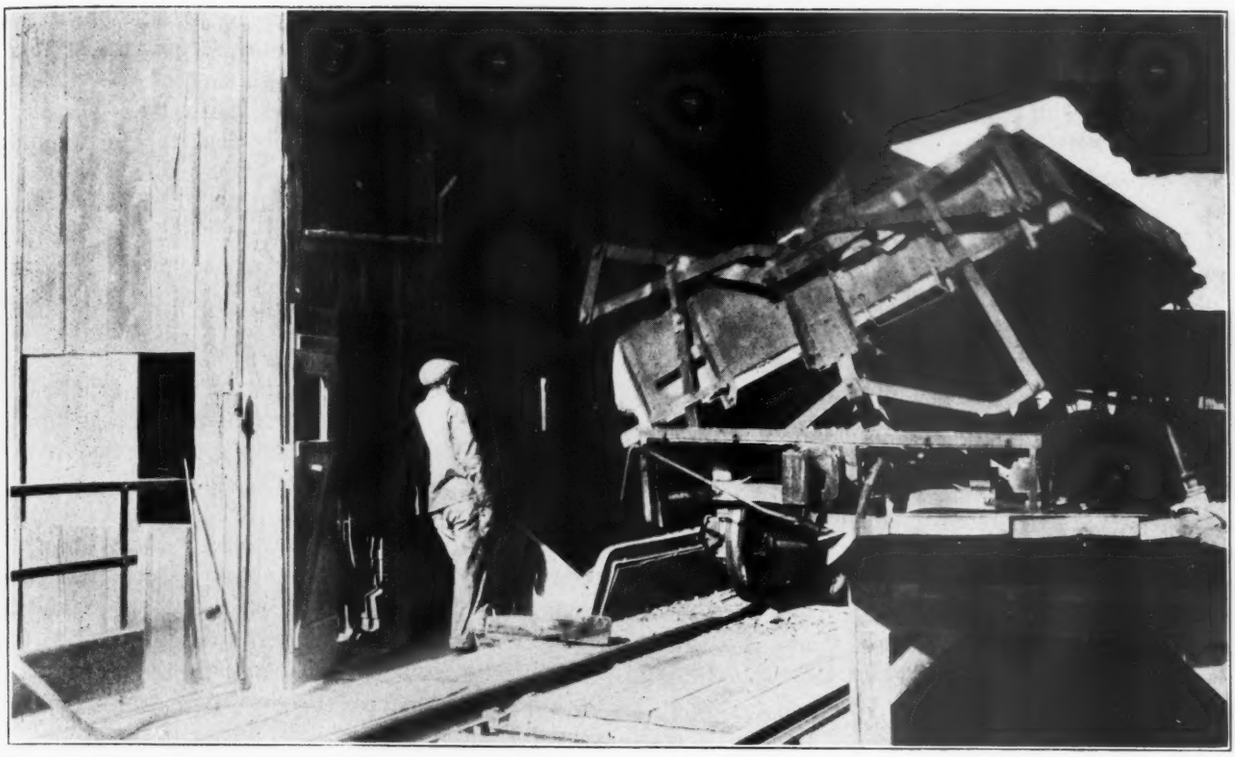


One of the Shovels at Work in the Quarry

consists of having a locomotive tender which holds a 3 days' supply of coal and 24 hours' supply of water. These supplies may, of course, be replenished by simply detaching the tender from the shovel, without interrupting its operation, and hauling it by means of one of the quarry locomotives to the coal storage bins and water crane. The shovels are also equipped with generators that furnish illumination for the night operation.

As only a small amount of shale is required in the cement making process, it is only necessary to excavate this material occasionally. Consequently one of the shovels from the large limestone quarry is run up to the shale quarry once a day or every two days for an hour or so which is sufficient to procure a supply. The operations at this quarry are really very simple as the shale is so soft that secondary drilling is not necessary and, further-

The Shale Quarry



Emptying Quarry Cars by Means of Air Hoist at the Primary Crusher at Extreme Right

more, it does not have to be passed through the primary crusher but may be transported direct to the secondary crusher of the cement plant. Limestone is loaded into 12 yard Western side dump cars and is hauled to the primary crusher by saddle tank locomotives. There are four cars to a train, and each train is manned by an engineer and a conductor. The shale is transported in 50 ton bottom dump cars.

This gives a general idea of the quarry operations but there are numerous details of the equipment which are interesting and, on the whole, unusual, especially in the manner in which they are carried out. As stated at the beginning of this

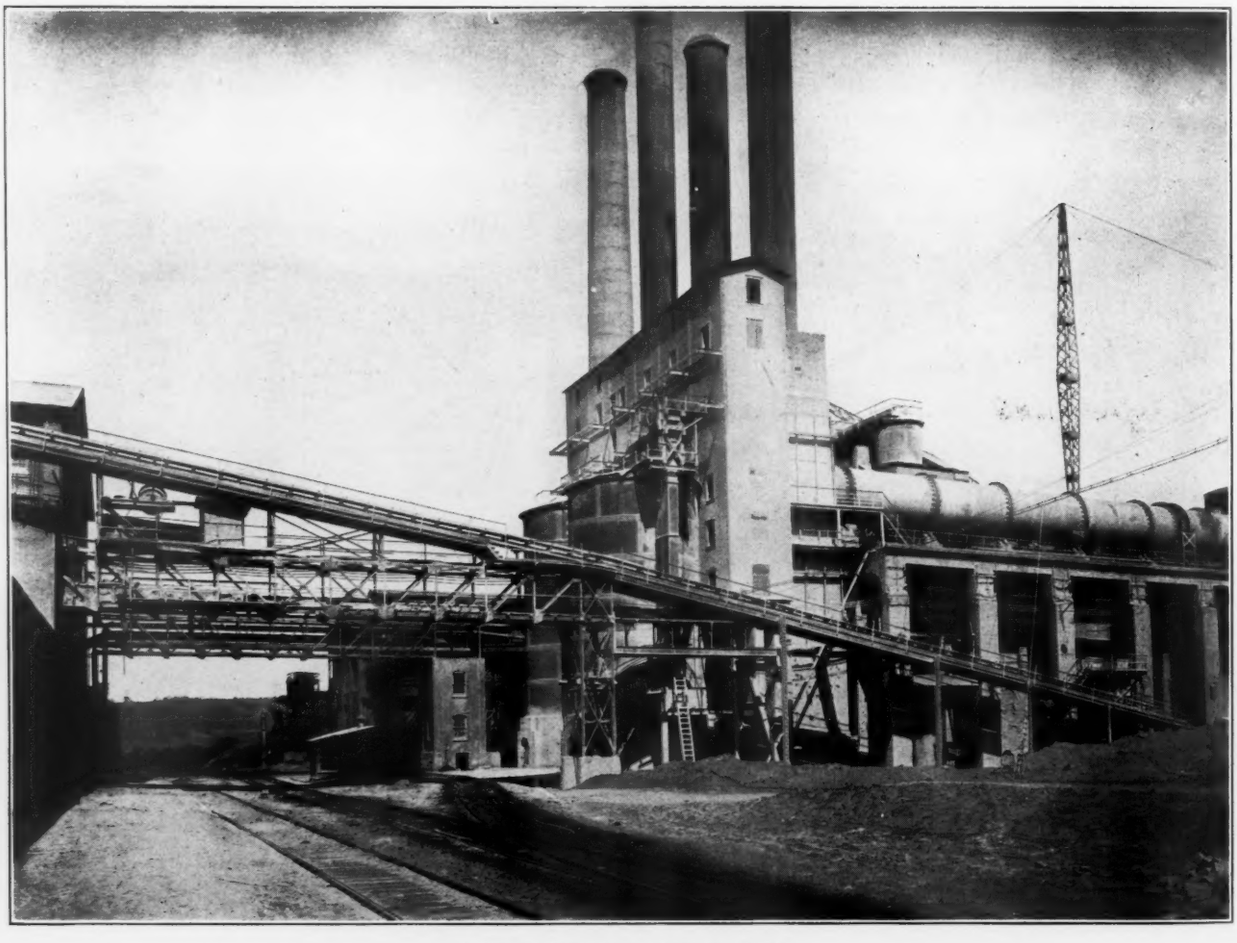
View of Large Quarry. Note how the Tracks Converge Toward the Cut Loading to the Primary Crusher

article, the labor turnover is very low, particularly for an operation of this kind. Of course there are good reasons for this and the credit and responsibility rests, in the last analysis, with the management.

For instance, a shelter house is provided for each drill crew, which must work continuously, regardless of the weather. These shelter houses may be moved from place to place as the drills are moved. They are also refuge, in which the drillers can dry their clothes, get warm, eat their lunches and otherwise find relief in inclement weather.

Another small house has been built on a commanding location completely overlooking the shale quarry and the large limestone quarry. In this is located the blasting switch, a standard safety disconnect switch, and from it permanent wires have been run to terminals in various parts of the quarries. Temporary flexible leads are run from these terminals to wherever the shot is to be fired. Fuses are made up with caps for secondary blasting in this house.

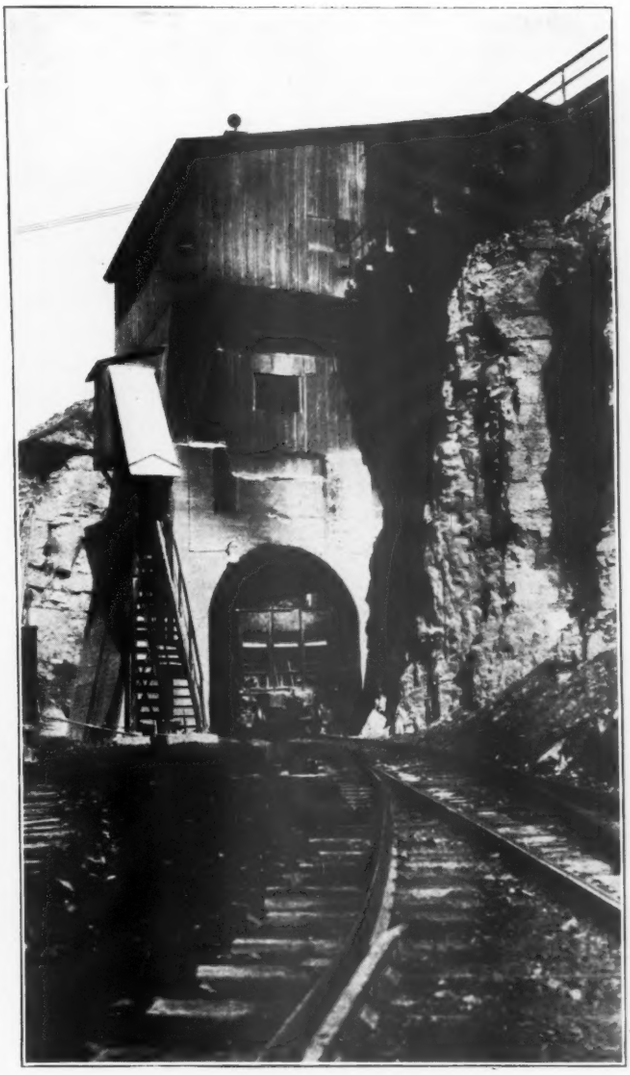
Preparatory to loading a well drill shot, after the holes are baled out a competent man is placed in charge of the magazine and superintends the loading of the wagons. He also checks the cases as they are being loaded to be transferred to location. The blaster foreman is in charge of the operation on location with a crew of competent and experienced employees. The blaster foreman first superintends the handling and placing of the different grades of dynamite in their respective places for loading. He also personally inserts the detonator in the cartridge at the hole that is being loaded, and he checks up the amount and grade of dynamite as it is being loaded into each hole, and also personally superintends the steming. Wooden mallets are used in opening the cases and wooden poles suspended by a rope used in tamping. No one is permitted around the holes as they are being loaded, except those engaged in the operation. A great deal of care is taken in connecting up the shot and this is personally superintended by the blaster foreman. The first step in this operation is to see that the power switch is locked open and that lead wires are disconnected. Each detonator is tested with a galvanometer before and after steming. After this test the wires are connected to the lead wires and all joints taped. Before connecting the lead wires to switch they are tested with a galvanometer. When this operation is completed the blaster foreman sends out men to different points back of the face to warn the employees, and an air whistle is blown as an additional warning. The quarry superintendent and blaster foreman personally see that everybody in



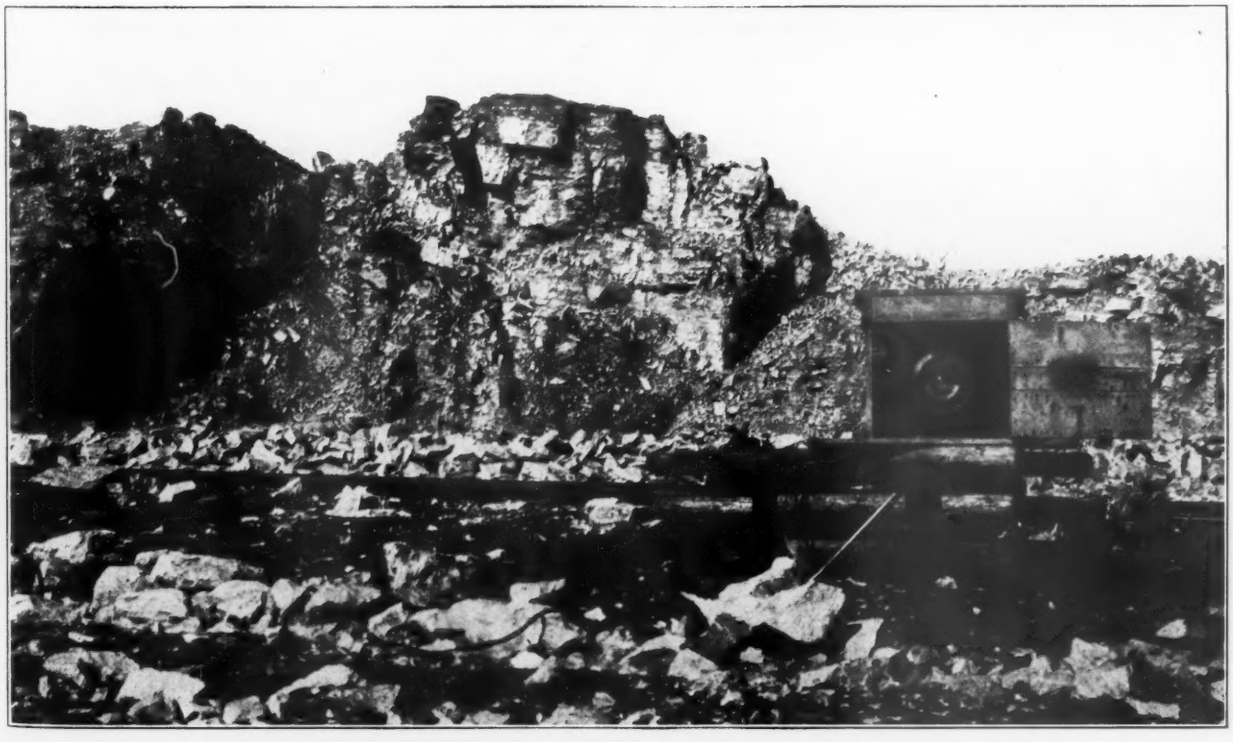
View of the Plant Showing Kilns

the quarry is in the clear, giving them ample time before the signal is given for closing the switch which is done by the assistant blaster foreman. After allowing a short time to elapse the blaster foreman and his crew inspect the blast to see that there is no evidence of mis-fire. In fact, these arrangements have been so carefully carried out and such great care is always exercised that so far there have been no serious blasting accidents during the eighteen years that this operation has been under way.

The explosives are stored a long distance from the quarry and plant in a concrete magazine construction of which is approved by the State, and the premises around the magazine for a radius of 50 feet are maintained in good condition. The state license is posted inside of magazine. The magazine door is locked at all times. The condition of this building is checked regularly by the quarry superintendent. Rules for dynamite magazines are carefully observed. The oldest stock is always used first and dynamite boxes are never opened in or near the magazine. Fuses and caps are stored in a separate magazine provided for this purpose. The thaw house is approved by the State and heated by water coils in a separate building located in a lean-to at the side of the thaw house. The boiler is located about 100 feet from the thaw house. When it is necessary to thaw dynamite it is transported by horse and wagon from the magazine to the thaw house and the same precautions are used in handling the dynamite as when transporting same to the well drill blast, blaster foreman being in charge of the work. There is also a small



Primary Crusher House



Portable Flood Light Unit in the Quarry

concrete building or magazine between the old and the new quarries in which the explosives required for secondary blasting are stored. It is emptied every night. The quarry superintendent personally supervises the handling and use of explosives and considers this responsibility of first importance. The men handling explosives are being constantly reminded of the dangers involved with the idea of training them at all times to take proper precautions and safety measures for their own protection in this operation.

On the floor of the old quarry there are several more buildings of a larger size. One of these, constructed of galvanized corrugated sheet metal and concrete floor. It is divided into several compartments. There is a compartment for the blasters and secondary drillers, one for a repair and tool shop; and another for the trackmen and pitmen. In addition there is the quarry superintendent's office and a shovel operator's shelter. Located on the outside of the latter, is a siren by means of which signals are given, to call in foremen and give notice of requirements for stone at the primary crusher. This has proved to be a very useful piece of equipment and has done much toward realizing the high degree of efficiency obtained. There are several repair shops in the quarry, all in separate buildings. These include a drill repair shop, a combined blacksmith and car repair shop. There is also the shovel repair shop where the major repairs are made to the shovel equipment.

A very serviceable and practical piece of equipment used in the quarry is a 1,000 watt flood light. This is a portable unit and there are five of them in service. They are used for secondary drilling at night. In a continuous process such as making cement it is, of course, necessary to manage the processes of producing the raw materials in the quarries in such a way that there will always be an adequate supply. This naturally makes it necessary to take precautions to meet emergency conditions, and hence, among other things there is a square shovel ready to take place of one which might break down, and the flood lights making it possible to do night work when, for any reason, the demands of the cement plant call for it. Formerly it was necessary to maintain a rather large pumping installation to keep the quarries dry. This, however, has been eliminated by cutting through walls of rock, thus providing a positive drainage.

Before leaving the quarries it is worthwhile to pause a few moments for the purpose of consciously apprehending the very unusual condition in which the buildings, equipment and general condition of the premises are maintained. Probably the feeling of satisfaction which the visitor experiences is due in large measure to the absence of broken down machinery and rubbish scattered here and there, to the fact that all the buildings which he sees are neat and clean, that the floor of the quarries is free from incumbrances that do not belong there, and that the men do not go about their work as convicts at forced labor but rather with a good natured seriousness which means to argue a certain degree of satisfaction. There are many men who have been on this job as long as 10 to 15 years. It is worth pausing long enough to realize these facts and to consider their significance and importance in carrying on a successful business.

The primary crusher is a 36 by 60 inch Fairmount roll crusher. The trains of quarry cars are hauled to this crusher and uncoupled from the locomotive after being placed on the trestle over the crusher and at the same time the air brake line is attached to a long hose so that the brakes may be controlled by the operator stationed at the crusher, he having full view of the crusher operation. The tracks have a slight grade so that the cars may be run to the dumping point by gravity and stopped by the air brakes. The same man who controls the brakes also controls an air piston at the side of the tracks whereby each car is dumped. After all the cars of a train have been dumped the air hose is uncoupled and they are allowed to go back to the main track to the quarry by gravity. An air hoist cylinder is located over the crusher to break up blockades. The equipment here is arranged to handle 2,400 tons of stone in ten hours.

After the rock has passed through the primary crusher it drops thru a chute into other cars, operating on tracks on a lower level, that carry it to the rock house at the cement plant. These cars hold about 50 tons each and are of the steel bottom dump type with a very steep hopper to prevent the pieces of rock from jamming and forming a bridge across the opening so that they will not discharge their load. The tracks are graded so that the loaded cars run down to the rock houses by gravity, although they are placed in position for dumping by a locomotive. This locomotive also hauls the empty cars back to the primary crusher. Three trains of two cars each are in service. One train is loading at the primary while one is unloading at the rock house and the third is usually at the siding at either one end or the other waiting to unload or to be loaded. With this procedure there is no delay in keeping the cement plant supplied with raw material.

As these cars are dumped at the rock house of the cement plant the stone falls directly into the five secondary crushers. Each of these together with the succeeding machinery is a complete unit. This is made plain in the accompanying flow-sheet which it will be well to trace in the following description. One unit is used for shale or limestone, the others for limestone exclusively. Number 7½ Gates gyratory crushers are used. From them the stone drops to small two roll crushers, is raised by elevators to belt conveyors which deposit the crushed stone in a storage bin. There is a large

bin for the limestone having a capacity of 25,000 tons and a small one for the shale having a capacity of 2,000 tons. Under the limestone storage there are five tunnels each containing belt conveyor which discharges into as many elevators. These discharge into five rotary dryers each equipped with a number 50 Sturtevant Fan. As required, one of these driers is used for drying the shale.

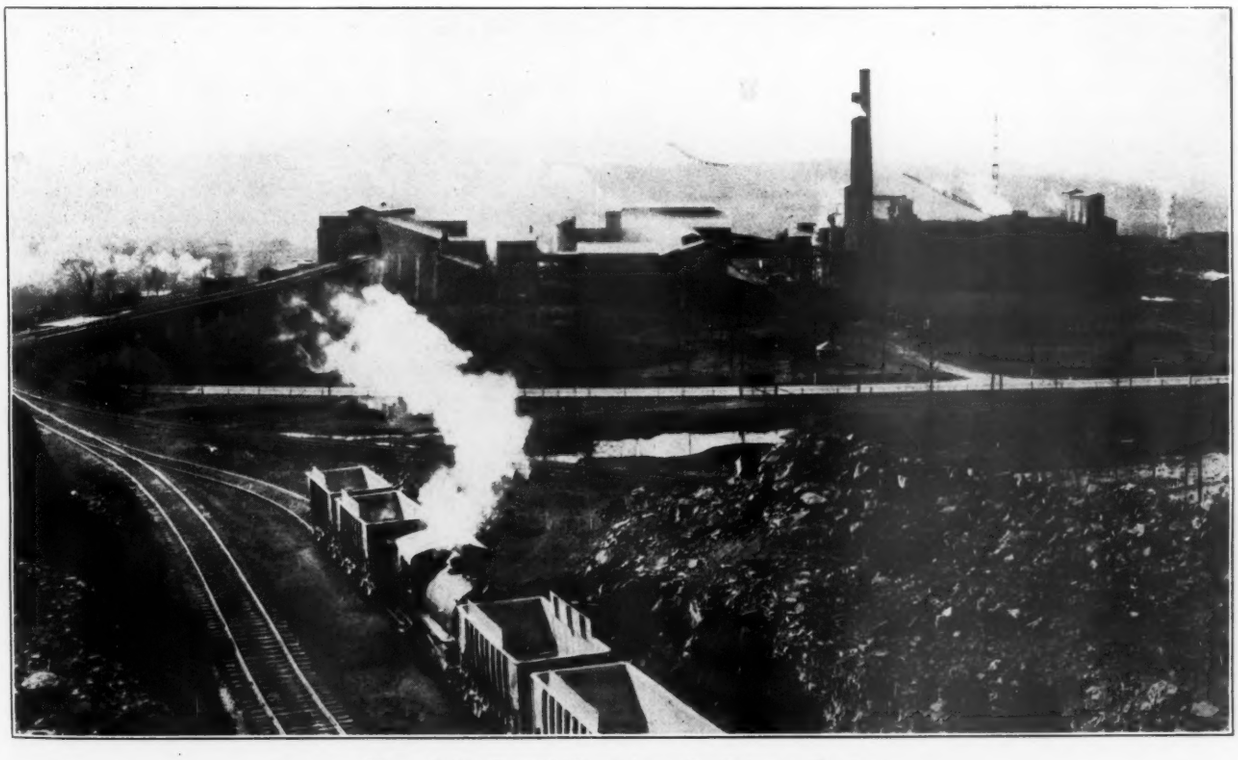
The secondary and the tertiary crushers are driven from a line shaft outside of the stone house. It is supported by Hill Clutch Company bearings and driven by a 600 h.p. McIntosh Seymour vertical engine. A cable drive from this shaft to another line shaft furnishes power to the rotary dryers. From the dryers the stone and shale drops to separate underground belts which carry it to elevators which raise it to belt conveyors depositing it in two series of three bins equipped with three automatic weighing machines.

The units used for shale may also be used for limestone up to the point where the weighing machines are reached. This is because such small amounts of shale are called for that this equipment would be idle a good deal of the time if used for shale exclusively. Consequently, without increasing the equipment, the production of the plant can be materially increased by using these units for limestone when not needed for shale. There are six weighing machines arranged in three pairs for combining the shale and limestone. These pairs of weighers are so arranged that it is not possible to dump one of a pair without the other, thus making it impossible to unbalance the mixture which eventually goes to the kilns.

The limestone and shale, in proper proportions, discharges from the automatic weighing machines into conveyors, these discharge into elevators which carry the mixture up to conveyor feeding the storage bins over each Huntington Mill. A tripper distributes the mixture into eleven bins arranged in a long row. Screw conveyors under each Huntington mill carry the material directly to eleven 6 by 22 tube mills. The tube mills all discharge through chutes into a 20-inch screw conveyor and this feeds into two large storage tanks and then into feed tanks from which the kilns are supplied.

There are five rotary kilns. Three of these are 235 feet long and 12 feet in diameter. The two others are 175 feet long by 6 feet, 5 inches in diameter. The fuel is pulverized coal which is reduced in a series of Huntington Mills and tube mills and is delivered to bins above the kilns by means of an elevator and screw conveyor. The coal is fed into the kilns by a blast of high pressure air which has been Atlas practice since the early days of cement manufacturing. It takes about 2½ hours for the pulverized mixture of limestone and shale to travel from one end to the other of the large kilns and the direction of travel is against the flame.

After leaving the kilns the burned clinker is delivered as shown in the flow-sheet to three rotary coolers having refractory linings; then through three 36 inch by 12 inch three roll crushers. The material is then further cooled by passing through three rotary coolers having a steel lining with shelves. The latter discharge into elevators which



View of the Cement Plant from the Primary Crusher

deliver the clinker to automatic weighing scales where gypsum is added ahead of these scales.

This mixture of crushed clinker and gypsum is delivered from the weighing machines to a belt conveyor which delivers it by means of a tripper into bins over Huntington Mills followed by 6′x22′ tube mills. From here the finished product is taken by a 20 inch screw conveyor to the 18 storage silos which hold about 120,000 barrels in all. From the storage silos a screw conveyor takes the cement to the packing house, where it is delivered to the four Bates packing machines. A railroad spur along the side of this building reduces the handling of the filled bags to a minimum.

Not all of the cement from the finishing mill goes to this packing house. There is another large stock house on the shore of the Hudson river about a mile away. The screw conveyor is arranged so as to deliver to cars, for bulk transportation over the company's own tracks to a point on the east side of the main line of the New York Central R. R. About 250 yards from this point is a large stock house, which is located between the New York Central R. R. and the river. This stock house holds about 250,000 barrels in bulk.

The finished cement is dropped into this enormous bin from under the ridge of the roof to whatever point it needs filling. A large excavator, spanning the width of the building and traveling along its length, is used to load cement into a screw conveyor which carries it to the packing house. The latter is provided with four Bates and two Hercules packing machines. This building is located with the dock on one side and a railroad spur on the other. Belt conveyors are arranged for carrying filled bags of cement directly from the packing machines to barges, moored at the dock. At this river plant there is also a department where used cloth bags are cleaned, repaired, tied and stored.

Laboratory

Of course a very complete laboratory forms an important part of the establishment. This is manned by a chief chemist and a number of assistants. This laboratory is modern in detail and fully equipped to make all the standard tests as outlined in the Standard Specifications and Tests for Portland Cement. Records are kept here covering the quality of the product throughout the manufacturing process and all shipments.

The chemical laboratory is exceedingly important as it is here the mixture of raw materials later to be made into cement is controlled. It is done as follows: One of the eleven Huntington mills into which the mixture of limestone and shale goes immediately from the automatic weighing machines is under the control of the laboratory Samples are taken from this machine every hour during the 24 hours of the day and analyzed to make sure that there are no variations which might interfere with the quality and uniformity of the cement.

Dust Collecting

Attention has already been called to the fact that this plant is maintained in a most strikingly neat and clean condition. The question of the dust control has been one of first importance throughout

River Stock Storage House at Right and Screw Conveyor on Bridge to Packing House in Background

the operation of this plant and the absence of dust is very noticeable when making a trip through the buildings or around the yards. The control of dust in a dry mill presents a very difficult problem. This problem, however, has been very carefully handled by the company and complete dust collecting equipment is to be noted throughout the whole operation. The stone drier fans discharge into a cyclone and the cyclone is relieved through long dust tubes made of canvas. This same equipment is operated in connection with all conveyors and elevators throughout the mill. Hoods are provided above all scales creating a suction for the collection of dust; also hoods are provided at all the Bates packing machines so that the pack houses are clean and free from dust. The gasses leaving the coal driers pass through water sprays. In the system of dust control that has been installed throughout the plant an original and unique method was devised for washing the kiln gases. The gases leaving the kilns pass down through large towers about 50 feet in height known as rain towers. Over the top of these towers is a basin which is kept full of water. In the floor of this basin nozzles are inserted. The water passing through these nozzles creates a fall of water in the tower resembling heavy rain. The vicinity shows no abnormal precipitation of dust and the gardens and orchards around the plant are producing excellent results, and there is no criticism of any dust nuisance from the people living near the plant.

Power Department

The company develops its own power. This equipment consists of ten 400 h.p. B. & W. boilers equipped with Ronie stokers. The feed water first passes through a primary heater then through an additional heater into the Green fuel economizers. A very high efficiency is maintained by the steam generating plant. Electrical energy is supplied for the small motors by three 400 h.p. General Electric generators direct connected to McIntosh and Seymour horizontal tandem compound engines. Two Norwalk tandem compound, two stage compressors supply the air for the kilns and the quarry, and, for other secondary uses around the mill. The raw grinding mill is operated by one 2,600 h.p. vertical cross compound engine, direct connected to a lineshaft, and the finishing mill is run by one 2,200 h.p. vertical cross compound engine direct connected to a lineshaft. As already mentioned the rock crushers and driers are operated by a 600 h.p. vertical cross compound engine. The coal mill is also operated by a 600 h.p. vertical cross compound engine direct connected to a lineshaft. The Power Department throughout is kept scrupulously clean and in order.

The company owns about fifteen houses which are occupied by the workers' families. They are scattered about the farm lands owned by the company, and any men who wish space for a garden may have it. The main office building is of stone and masonry and was formerly a farm house. Another one-time farm house, overlooking the river is now used for a dining room for the department heads.

A rather interesting and practical custom has been established here. The superintendent has lunch every day with all of his department heads.

Belt Conveyors from the Packing Machines Under Roofs to Boats Moored to the Company's Dock at the River Plant

They assemble fifteen minutes before lunch time in order that the superintendent may have an opportunity to discuss matters of business with one or more of the heads, and so that men who are responsible for operations affecting some one else, and this really includes the whole group, may talk over ways and means of overcoming such difficulties as they encounter. Sometimes these discussions continue through lunch and even later. If there is nothing especial which needs consideration the good fellowship which is fostered is of no secondary importance, as visitors who are made welcome at the table can heartily testify.

Cement a Business Barometer

A new barometer of business conditions has been established by the Department of Commerce by including each month in the statistics of the cement industry a figure showing the ratio of production to total capacity. This places the cement industry on the same statistical basis as the steel industry in that its operation ratio, production, shipments and stocks on hand will be made public monthly.

The statement for the month of September establishes the total capacity of the cement industry, as of September 30 last, at 229,020,000 barrels. This capacity, established by rates of production sustained over continuous periods of three months by each of the plants, indicates a total capacity for the year 1926 of at least 215,300,000 barrels.

Since January 1, 1927, new plants and extensions and betterments in old plants have raised this capacity, on August 31, 1927, to at least 228,300,000 barrels a year, and on September 30, 1927, to at least 229,020,000 barrels. On the basis of these revised estimates, the 1926 production amounted to 76.4 per cent of capacity.

The August, 1927, output represented approximately 94.4 per cent of the capacity of the plants for that month and the production for the first eight months of the year was 75.2 per cent of the capacity available during that period. Corresponding figures for September and for the first nine months of the year are 92.2 per cent and 77.2 per cent respectively.

Reconstructed Rock

Calcareous crushed stone made into artificial rock by mixing with cement is quite porous, very permeable to water, of mediocre strength and easily affected by water and freezing. On the other hand, artificial stone made from powdered marble and plaster of Paris, really imitation marble, has qualities of impermeability and strength that are remarkable. Anon (Union technique du Bâtiment et des travaux publics).

Industrial Situation in Brief

Weighing the various influencing industrial factors one with the other, it is gratifying to find the favorable factors for overbalancing those counted unfavorable. On the debit side of the ledger we have manufacturer's inventories that are still large, in spite of summer curtailment, stock speculation looming to alarming proportions, industrial profits irregular and in general tending downward; and the steel and automotive industries less active than one year ago.

The brighter side of the picture, however, shows agricultural purchasing power high, with crops turning out better than prophesied; wholesale trade gaining; car loading expanding slowly which would indicate increased consumption; the gradual disappearance of the coal strike menace; sustained activity in building trades; and bank debits continuing their upward trend. Sound health, with the prospect of immediate seasonal increases, is the present day condition of industry.

Calcium Sulphate Plaster

A sample of dead plaster, 2 years old, did not set owing to the formation of a skin of the dihydrate over each grain, which prevents diffusion of the supersaturated solution of the hemi-hydrate throughout the mass, each grain setting separately. The plaster may be restored by complete heating dehydration at 220 degrees C. The lack of hardness in setp laster may be due either to the presence of over-burnt particles, which rehydrate slowly, or to the addition of too much water, the best proportion being 45-60% of the weight of the plaster. By mixing plaster with only a slight excess of water over the theoretical quantity required for hydration at 80-90 degrees C. and subjecting the mass to pressure (varying with the size of the particles), samples were obtained with a high resistance to compression, a marble-like appearance and an apparent density greater than 2, but an attempt to prepare artificial alabaster was unsuccessful, the samples always being opaque. and having too low a density. If plaster is hydrated with boiling water, keeping the temperature above 63 degrees C., and the liquid mass stored in steam-jacketed vessels, it remains plastic for many hours, but when the temperature falls to 40 degrees it sets in the usual manner. In this way, machinery may be used to mix and work the plaster, a smaller quantity of water is required and the plaster may be stored during use. L. Chassevent (Ann. Chim. *1927, 7.* 43-68).

An estimated 7,211 children under fifteen years of age were killed in highway accidents in 1926. Several hundred of these child fatalities were the result of hooking rides or coasting in the public street.

LIME PRODUCED UNDER MANY CONDITIONS BY NEW ENGLAND COMPANY

By F. A. Westbrook

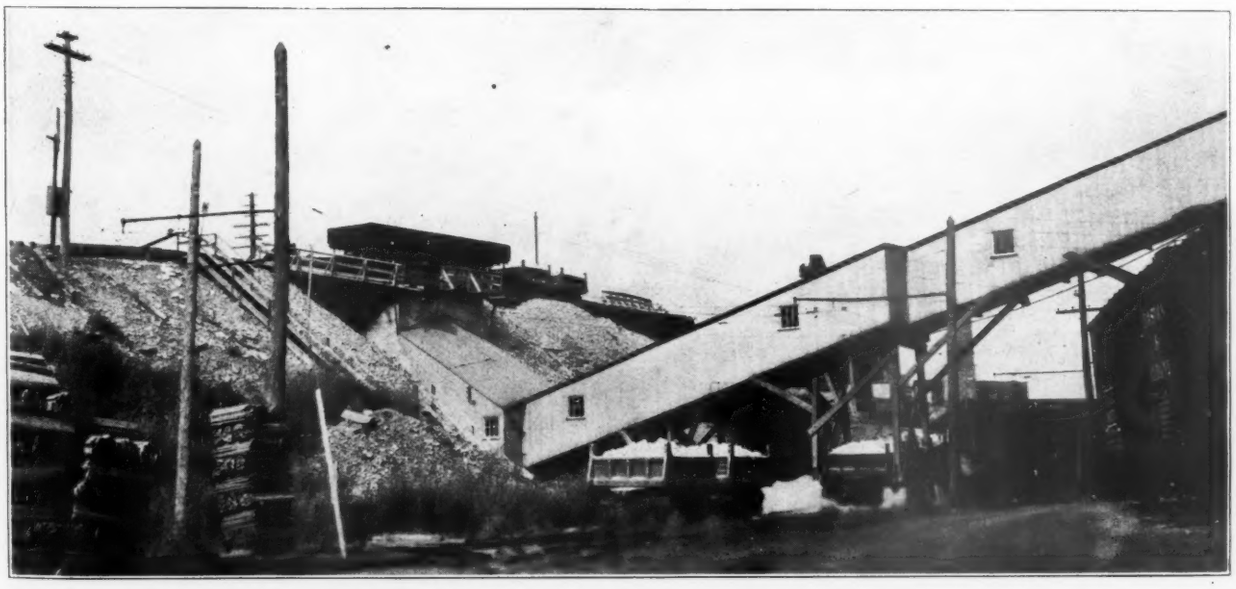
THE largest producer of lime in Knox and Waldo Counties, Maine, which together form one of the largest lime producing regions in the country, is the Rockland and Rockport Lime Corporation. It is the result of the combination of a large number of small concerns in the Rockland and Rockport district. At present the bulk of its activity is carried on right in Rockland, from which more lime is shipped by water than from any other port in the country.

The operations of the Rockland and Rockport Corporation are on such an extensive scale that it is an ideal place to see a large number of different activities side by side. Thus, for instance, there are gas, coal and wood burning kilns within a few hundred yards of each other, as well as a very up-to-date hydrating plant, mixing plant, cooperage shop and quarries to provide stone for burning, fluxing stone and crushed stone—all of these being connected by the Lime Rock Railroad, which is a subsidiary company. All of this is right in Rockland and although the company has some scattered, comparatively small scale operations, in the Rockport district, some six or seven miles to the northeast of Penobscot Bay, this article will be confined to the varied and highly concentrated large scale work centering in Rockland.

View of the Quarries Showing Depth of Cut

Lime Rock Railroad

The clearest idea of the layout of plants and quarries may be gained by first considering the Lime Rock Railroad. One end of this railroad is on the eastern side of Rockland Harbor where the gas kilns, wood kilns and one large battery of coal burning kilns, together with the hydrating plant,



Dumping Point for Fluxing Stone and Conveyor to Stock Pile

Some of the Dump Cars of the Lime Rock Railroad at the Quarries

fluxing stone storage and other departments are located. The railroad then makes a loop back of the city past the quarries and stone crushing plant and back to the west side of the Harbor where there are two batteries of coal burning kilns, wharves and so forth. There are 11.3 miles of standard gauge track, two Porters, one Vulcan and one Baldwin locomotive and about five hundred 4 yard Keith side dump cars. In addition there is a large repair shop where this extensive equipment is maintained, all of which is owned by a separate subsidiary corporation.

Quarries and Crushing Plant

Nine large and deep quarries are now being operated. There are many openings in the vein of limestone some of which have been abandoned permanently and some only temporarily. A good many of these holes date from the days before the consolidations took place when there were many separate operations. Now they have been reduced in number and the rate of production speeded up in those which are being worked. Of course, this has resulted in marked economies. In addition to owning all of the quarries around here and the unopened land immediately adjacent to them, the Company owns mineral rights over a wide territory so that there is no prospect of its ever running short of raw material.

There is one derrick at each quarry. Each is operated by Lidgerwood electric hoists equipped with Roebling wire rope. All of the stone is taken out on skips, made in the company's own shops. Blasting is done by drilling twelve foot holes with Ingersoll-Rand jack hammers and using Atlas dynamite as an explosive. Stone is taken out in benches.

The skips are dumped directly into cars on the Lime Rock Railroad. Some of the trainloads are run directly to the kilns and some to the crushing plant on top of the line of quarries. At the crushing plant the cars are dumped by means of a Curtis air hoist into the large Traylor jaw crusher. A Stephens Adamson bucket elevator carries the crushed stone up to a 4 by 14 foot manganese steel

Traveling Hoist at Gas Kilns. Stone Bins at Right, Quarry Car for Dust at Left

revolving screen having 4, 6, and 8 inch openings used mainly for fluxing stone. The Traylor Engineering and Manufacturing Company installed all of the equipment so far mentioned.

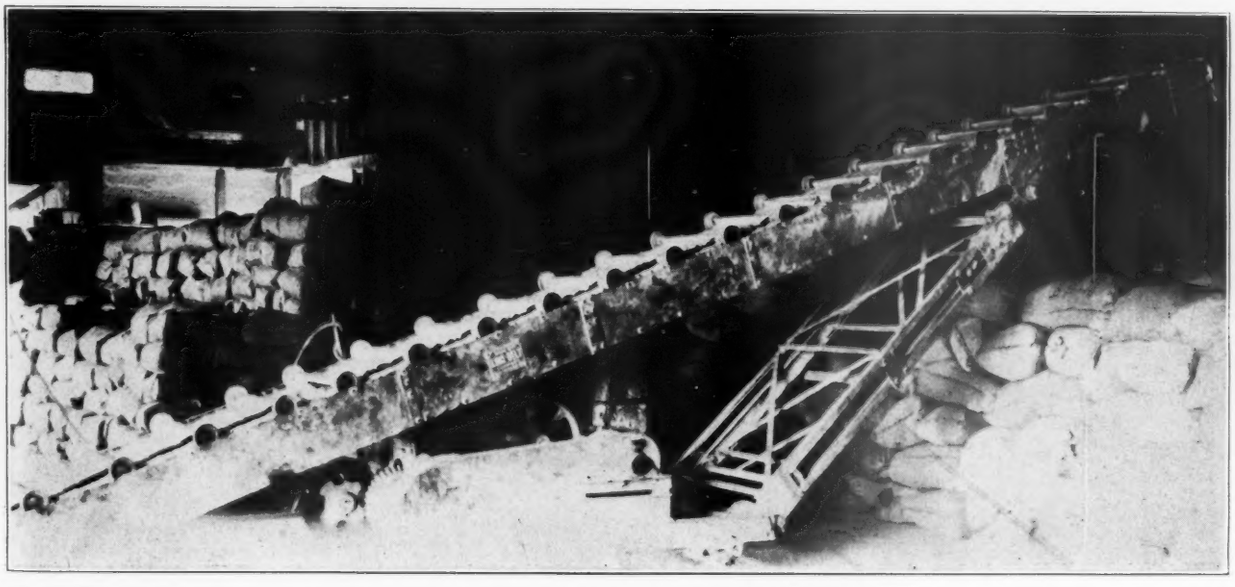
Material which passes through the 3 inch dust jacket of the revolving screen is taken by a Link Belt apron conveyor to a series of Link Belt vibrating screens which separate it into four sizes and drop them into separate bins. Stock piles are made outside when an accumulation occurs. This is sold for general contract work and at the present time a good deal is being used for state highway construction between Rockland and Rockport. Stone from the stock piles is loaded on cars (frequently regulation railroad freight cars) and trucks by an Erie steam shovel. More dust is produced than can be used. Consequently an 18 inch Link Belt conveyor has been installed under the dust bin which discharges the surplus into an abandoned quarry.

In addition to the tailings from the revolving screen accumulations of chips from the quarries are used for fluxing stone. They are loaded on skips dumped into cars and hauled to crushing plant and the proper sizes taken directly to the plant on the east of Rockland Harbor where most of the manufacturing processes, exclusive of burning are carried on.

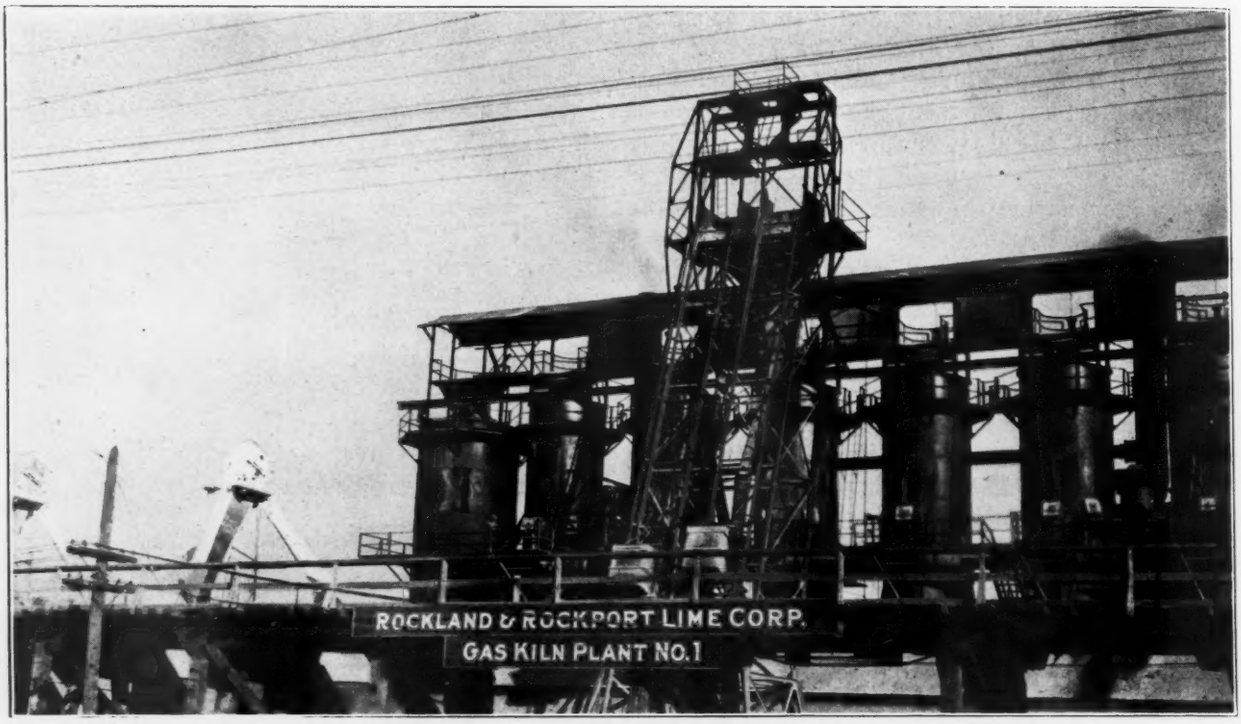
Fluxing Stone

Fluxing stone is supplied to the new Mystic Iron Works plant at Everett, Mass. It is all shipped direct by water. The stone for this purpose is brought down to the plant over the Lime Rock Railroad and is dumped from the cars into a bin or large hopper from which it passes through two Stephens Adamson roll grizzlies for further screening. It is then taken up an inclined Stephens Adamson belt conveyor which becomes horizontal over the stock piles close to the wharf. There is a tunnel under these piles for a belt conveyor passing over a Merrick weightometer so that as the stone passes out to the wharf and is loaded the exact amount is recorded. Shipments of fluxing stone as well as the large quantities of lime shipments made

Detail of Elevators and Chutes at Top of Storage Bins at Gas Kilns



Portable Bag Piler



View of Gas Kilns Showing Traveling Hoist

by water are mostly carried in the company's own vessels.

Gas Kilns

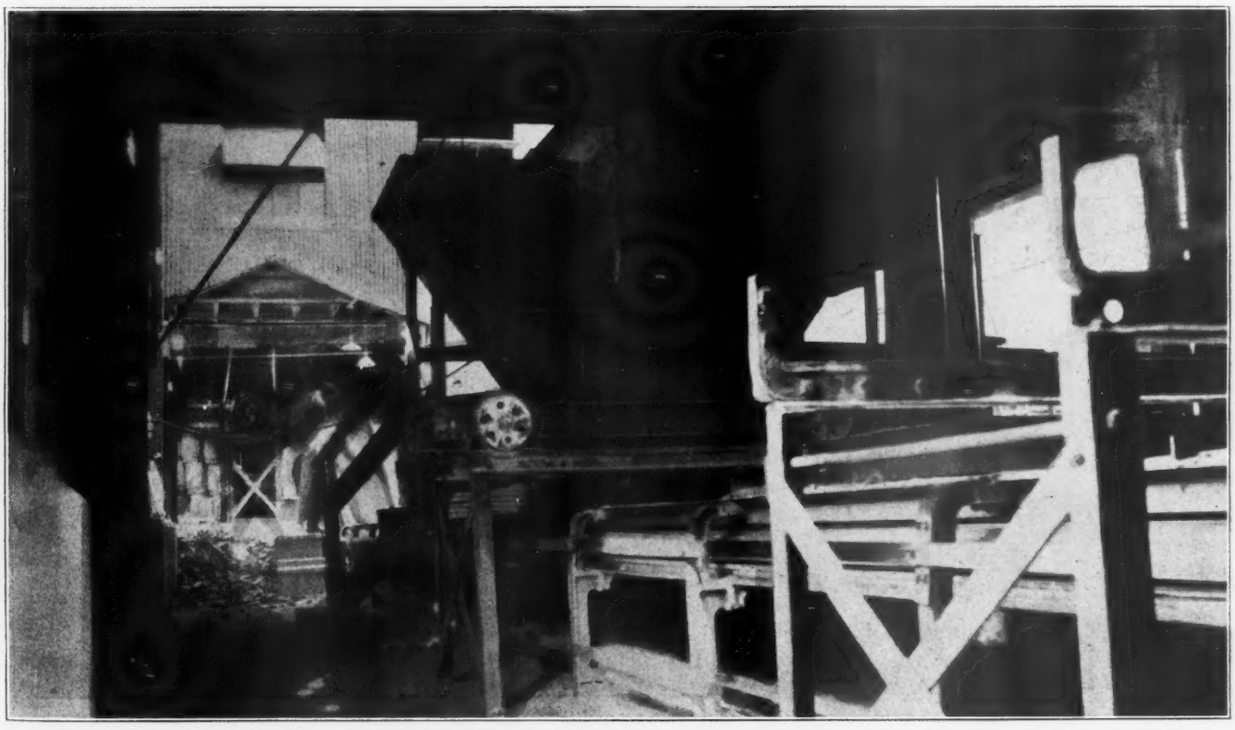
Of course as far as burning lime is concerned the most interesting feature here is the gas kilns. Six of these are in operation and one more is under construction and almost ready for use. Fuel is supplied by two 10 foot Morgan gas producers. Coal, which comes mostly from New York in vessels which carry lime in the opposite direction, is dumped from cars into a track hopper alongside the kiln house. The equipment here is all Link Belt. It consists of a feeder which passes the coal into a roller crusher, from which a belt conveyor takes it to an elevator. The latter discharges the crushed coal into a 100 ton steel storage bin which feeds by gravity into the gas producers.

One of the Quarries Showing Line of Derricks

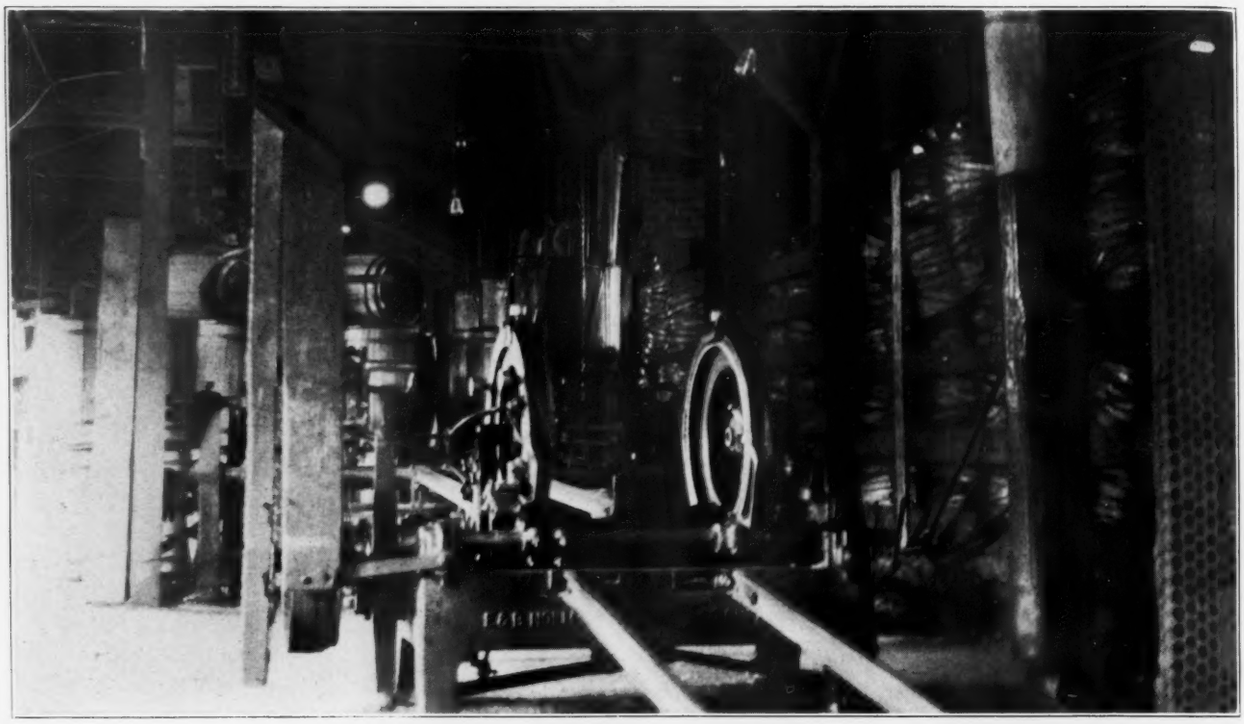
Interior of Storage House Under Bins for Gas Kilns, Showing Shaking Chutes and Portable Freight Car Loader

The method of feding lime into the kilns and of handling it afterwards is equally ingenious, and interesting as a very practical application of mechanical handling. This whole plant asociated with the gas kilns is Link-Belt equipped so this much may be taken for granted in the description which follows: Cars loaded with stone from the quarries are run out on a trestle and dumped into bins. A traveling hoist with two buckets, shown in the illustrations, moves along tracks at the base of the kilns. The bucket, or skip, is loaded with stone at the bottom through chutes, carried to the tops of the kilns and dumped as shown in the illustration. There is also a chute attached to the traveling hoist whereby accumulations of dust, not fit to go into the kilns is sent down again and discharged into a dump car on the tracks below.

The kilns have shear draw gates. Lime is drawn every 2½ hours and each kiln produces approximately 25 tons per day. As shown in one of the



Interior of Gas Kiln House Showing Car Into Which Lime is Drawn and Pan Conveyor Leading to Sorting Tables in Rear



Part of Cooperage Shop

illustrations a 24 inch pan conveyor extends along the base of the kilns and into the storage building. From under each kiln a track extends out over the pan conveyor and at right angles to it. A steel bottom dump car is pushed under the gates, the lime is dropped into it and the car is then pushed back over the pan conveyor. Here the lime is dumped on to the conveyor, which carries it up a short incline to two moving sorting tables. Rejected material is thrown into a pit from which it is taken by another pan conveyor at right angles to the first and discharged into a dump car outside.

The good lime is carried on by the sorting tables and dropped into two hoppers, one for each table, and from there it is lifted by elevators to the tops of the final storage bins. There are four of these steel storage bins and each elevator is arranged to serve two, as shown in the illustrations.

Under each storage bin there is a shaking chute. These feed into a portable car loader. Freight cars

Dumping Rock Into the Crusher. Note Character of Electrical Installation

Crushing and Screening Plant with Steam Shovel at Right Working in Stock Pile. Note Safety Warning

are brought up to the side of the building and with the combination described it is possible to load a 30 ton car in bulk in 20 minutes. A great deal of this lime is also loaded into the company's own cars and taken over to the hydrating plant.

Coal Kilns at Gregory Plant

There are three batteries of coal burning kilns. Two of these have five kilns each and are located on the west side of the harbor. The third, known as the Gregory Plant, has eleven kilns and is located on the east side of the harbor near the gas kilns. So far as firing is concerned there is nothing special to require attention at this time.

The most interesting thing about this plant is the prepared plastering lime, known by the trade name of "Fail Proof Lime," which is produced here. When the lime is drawn from the kilns it is first sorted on the kiln hearths and then taken in wheelbarrows or pushcarts and dumped into a single roll

Lime Storage Bins at Gas Kiln House. Note Arrangements of Chutes from Elevators at Top

Link Belt roller crusher. From this it drops to a Link Belt belt conveyor which carries it to an elevator of similar make equipped with a magnetic pulley at the bottom. The lime is then lifted into two stel storage tanks of 350 tons capacity each.

The storage tanks feed through steel chutes into a Williams Patent pulverizer for a final crushing and this material is then taken by a Link Belt elevator to a batter of Hummer screens. The material passing through the Hummer screens drops into bins over four Howe barrel packers. The overs from this screen pass through a chute back to the Williams pulverizer. An interesting detail about this crusher is that a Reeves variable speed transmission is used on the feeder to it. A dust collecting system has also been installed at this crusher to keep the atmosphere as clear as posible. A Broughton mixer is also used to mix fibre with the pulverized lime to make a "Failproof" fibred lime.

Of course this special preparation does not take up the entire output of the kilns. Much of it is shipped in barrels and some goes to the hydrating plant. Tracks of the Lime Rock Railroad pass through all buildings and all parts of the plant. Under the track passing this building there is a hopper with a Link Belt conveyor to the single roll Link Belt crusher. Thus we see that full flexibility is provided, in that burned lime may be brought here in cars from any of the other kilns if for any reason it be desirable to do so.

Among the buildings at the east side of the harbor the cars are hauled by trolleys rather than by steam locomotives. There are four of these electric locomotives and they are powerful enough to haul full szed railroad freight cars.

Wood Kilns

In addition to the gas and coal burning kilns there is a group of three wood burning kilns at this point. They were formerly owned by a concern which was bought by the present company. They are kept in operation to supply the market demand for wood-burned lime.

Cooperage Shop

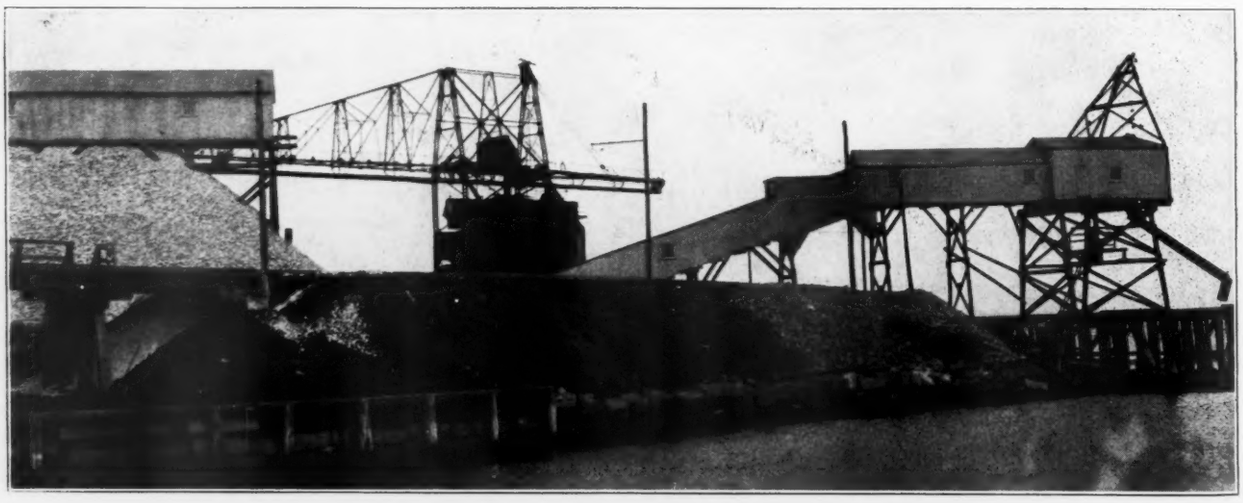
As might be expected in a large lime plant there is a very complete cooperage shop. The barrels are made with tongued and grooved staves to prevent leakage. The equipment was all made by the E. & B. Holmes Machinery Co. and consists of a tonguing machine, windlass, heaters, trusser, crozer and two heading machines. With this equipment seventeen men can make twelve hundred barrels per day, including the handling of raw material and finished product.

Hydrating Plant

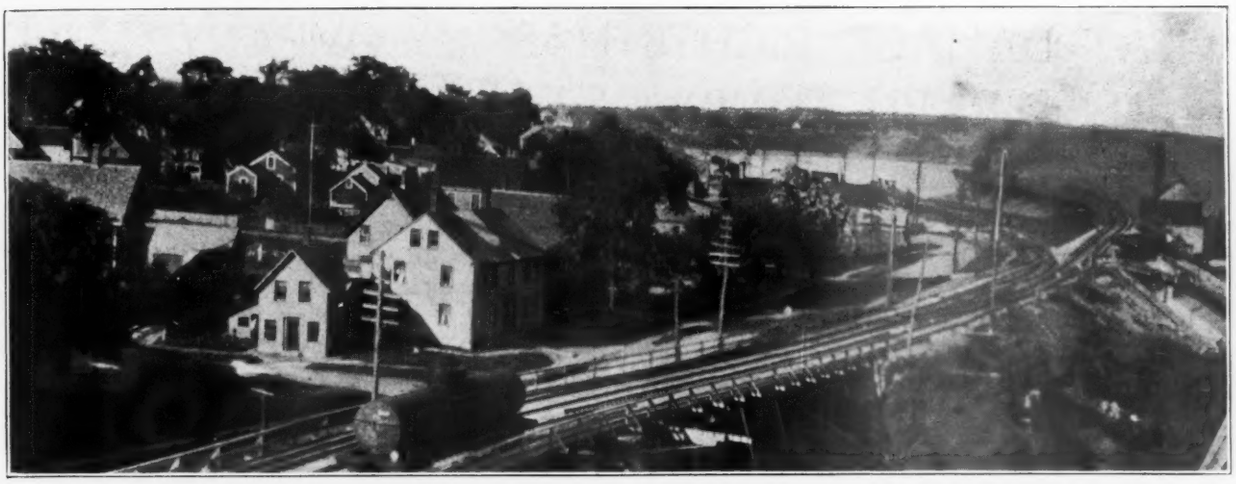
The hydrating plant is divided into two parts, known as Mill number 1 and Mill number 2. Agricultural lime is produced in Mill number 1 and the finer grades in Mill number 2. Both are models from the standpoint of mechanical handling and good equipment.

Burned lime is brought from any of the kiln plants in cars and dumped into a large hopper or bin. From this a chute leads to a McLanahan crusher. It is next elevated in a Link Belt elevator to a chute near the top of the building. This chute has a gate whereby the ground lime may be directed into a bin which is the beginning of Mill number 1 where agricultural lime is made, or it may be sent on to a Link Belt conveyor, 60 feet long, to a steel tank which is the beginning of Mill number 2.

In Mill number 1 from the elevated bin the lime descends through a spout to a Sturtevant pulverizer and then through another spout to a Raymond ring roll pulverizer, thus reeciving two additional reductions in size. The pulverized lime is next elevated to another bind feeding by gravity to a Sturtevant screen. Oversizes from the screen pass through a chute back to the Raymond pulverizer. Lime passing through the screen is picked up by a Link Belt elevator and dropped into a Kritzer hydrator. At the bottom of the hydrator there is a screw conveyor to carry the now hydrated lime to an elevator extending to the top of the building. Here it is



Arrangement of Conveyors over Stock Piles of Fluxing Stone and Under Them to Carry Material to the Dock for Loading



Arrangement of Tracks and Kilns on East Side of Harbor

taken by a second screw conveyor to bins over the Wade open mouth bagging machine. The screw conveyors and elevator are Link Belt. The bagger has a capacity for six bags and with it is used a Toledo scale for finishing off the bags.

We have already seen how the lime from the first crusher is deposited in a steel tank by means of an elevator and belt conveyor. From this steel tank it passes in Mill number 2 through a spout to a Raymond pulverizer and then by air suction to a tank over a Kritzer hydrator. At the bottom of the hydrator there is a Link Belt screw conveyor to take the hydrated lime to a Link Belt elevator. The latter deposits it in a tank and from this it passes through a spout to a Raymond separator; then by air pressure through two pipes to bins over a Bates valve bagger and a Howe "Iron King" barrel packer. These pipes are provided with gates so that either may deliver into either bin. Sturtevant blowers are used.

When it comes to disposing of the bagged lime a great labor-saver has been introduced in the form of a Link Belt portable bag piler. Bags are brought into the stock rooms on four wheeled trucks. They are lifted off by hand and placed on the piler which carries them up to the point where they are being piled. It can put up 1700 paper bags in a day. This machine works just as well for taking bags down from the piles. As very large stocks of bagged lime are carried at certain times of the year the piler has paid for itself many times over.

General

One of the striking features of the installation of machinery is the neatness and exceedingly safe manner in which the electrical equipment has been installed. All wiring is either in conduit, flexible or rigid, or in the form of armored cable, including the motor leads. The switches and control apparatus are conveniently mounted on the walls. The motors themselves are in all cases mounted on very substantial foundations. They are all induction motors, mostly of General Electric make, and are provided with Foote Brothers reducing gears instead of belts. Since these have been used the saving in wasted power due to slipping belts, heavy maintenance and lost time has shown a handsome return on the investment.

The elimination of belts in the dusty operations carried on in plants of the kind found here, especially where there would otherwise be so many belts, is easily seen to be a great advantage.

As regards upkeep of machinery there is a daily inspection and lubrication by trained men of all machines in operation. The company also has its own repair shops where all repairs are made, before a breakdown occurs, if in any way possible. This of course means keeping on hand a supply of spare parts and in some cases extra motors and the like. A good deal of this is done at night where necessary to avoid interference with production.

The question of personnel management has been gone into with great care. With 500 employees on the payroll this is naturally of importance. Safety has been given first consideration and in going around the plant one is struck by the obvious precautions which have been taken in the way of railings, gates, stairways kept clear of slippery dust and pieces of stone or other material and warning signs at all points where they might be of benefit. Among other advantages of a different kind offered to its men by the company is a cooperative store where almost anything may be purchased that is found in a good general country store at very low prices. The hours have been arranged so as to provide for a worthwhile amount of leisure at the end of the day. In summer operations start at 6:00 a.m. and close at 3:30 p.m. with a short period for lunch. In winter the work day starts at 6:30 and ends at 4:20 in the afternoon with a half hour longer for lunch as in cold weather it is necessary for the men to take time to get a hot meal. From all this it will be seen that the Rockland and Rockport Lime Corporation is a thoroughly modern concern in all respects.

WHAT DAMAGE RIGHTS HAS A COMPANY WHEN TELEGRAPH COMPANY FAILS TO DELIVER?

By Leslie Childs

THE question of the liability of a telegraph company for loss caused by its failure to deliver a message, is one of many angles, and has been the subject of much litigation. But, since each case of this kind has necessarily been decided in the light of its particular facts, the subject cannot be covered by any hard and fast rule.

However, as an illustration of judicial reasoning on this point, which involved a case arising in the sand and gravel field, the Missouri case of Lutesville Sand & Gravel Company v. Western Union Telegraph Company, 296 S. W. 252, is well worth reviewing. The facts and circumstances which culminated in the action were, briefly stated in so far as material here, as follows.

In this case the plaintiff was engaged in the sand and gravel business, with its principal offices at Cape Girardeau, Mo. In the regular course of business, it received a telegram from one Noonan, a highway contractor, to ship him three cars of gravel daily to De Lisle, Mo., until further notice.

The plaintiff accepted this order and shipped gravel under it for several months. Thereafter, on December 4, Noonan telegraphed the plaintiff as follows: "Stop shipment material until further notice."

Noonan delivered the above message to the office of the defendant, telegraph company, at Portageville, Mo., and it was duly arrived at the office of the defendant at Cape Girardeau. Here it was inadvertently filed away with certain records, and was not delivered to the plaintiff as intended.

In the meantime plaintiff continued to ship gravel to Noonan until December 10, and during this time a total of twelve cars was sent. On this date, plaintiff received a letter from Noonan, advising of the telegram that had been sent, and stating that he would be unable to handle the gravel shipped him contrary to instructions.

Upon receipt of this letter, plaintiff took the matter up with the defendant's local agent at Cape Girardeau, and the mislaid message was located and delivered. Following this Noonan consented to accept two of the cars of gravel, which left ten cars on plaintiff's hands at De Lisle with no market therefor at that point.

Plaintiff was then compelled to have the gravel reconsigned to Cape Girardeau where it was sold to a cement contractor. Thereafter plaintiff brought the instant action for damages against the telegraph company for the loss it had suffered by reason of this transaction, which was caused by the failure of the latter to deliver the telegram from Noonan promptly.

In defense, the defendant set up that it was not liable to plaintiff because it (the defendant) was the agent selected by Noonan to deliver the "stop shipment" order; and that until such message was delivered Noonan was obligated to accept the gravel shipped. From this it was argued that plaintiff had voluntarily released Noonan from his obligation to accept the ten cars of gravel, and that such act was the proximate cause of the loss. Therefor it was contended that the loss was not caused by any negligence on its, the defendant's, part.

Upon the trial of the cause, however, the trial court declined to uphold the contentions of the defendant, and the trial resulted in a judgment for $513.15 in favor of the plaintiff. From this the defendant appealed, and the higher court in reviewing the record, among other things, said:

"We are quite familiar with the doctrine generally accepted in this country that one who takes the initiative in using the telegraph as a medium of communication makes the telegraph company his agent for the purpose of communicating his message. * * * However, even though the above is true, it nevertheless does not follow that plaintiff may not recover directly from defendant for such special damages as it may have sustained through the breach by defendant of its public duty to deliver the message in question with reasonable promptness. * * *

"In an action in tort, as this is, such damages may be recovered as are shown to have been the natural and promixate consequence of the failure of defendant to have delivered the telegram promptly. What could have been more naturally contemplated by defendant in accepting a message for transmission and delivery, asking plaintiff to stop shipments, than that further shipments would be made if the message was not delivered?

"The damages in this case had fully accrued before the negligence of defendant was discovered. Thereafter, plaintiff did the best it could to minimize the loss, and the damages it finally sustained were directly traceable to the negligence of defendant, for the reason that, if the telegram had been promptly delivered, the gravel would not have been shipped from Lutesville to De Lisle, and the freight charges thereon would not have been incurred. * * *"

In conclusion, the court affirmed the judgment rendered by the trial court. Holding, as outlined in the opinion, that the plaintiff was entitled to recover the damages it had suffered directly as a consequence of the failure of the defendant to deliver the "stop shipment" order promptly.

NEW DEWEY WET PROCESS CEMENT PLANT COMPLETE WITH FEATURES IN DESIGN

WITH twenty years of operating experience back of the Dewey organization it is perhaps natural that this company's new plant at Buffalo, Iowa, near Davenport, should represent the best that modern engineering affords, for many of the practices now common in the cement industry were first instituted by this company at their Dewey, Oklahoma, plant. The new Davenport plant, from which cement was first produced on June 18 of this year, was carefully planned, designed and built and the result shows in the quality of the output produced.

Every building is of concrete and steel construction. Each piece of mill machinery has an individual motor to operate it, all belts, pulleys and shafting being eliminated. The waste heat power plant generates 5,000 h.p. and while two kilns only are now being operated, buildings are designed and machinery foundations are in place for increasing the capacity of the plant 50 per cent by the installation of a third kiln. At present the plant has a capacity for producing 4,400,000 sacks of cement per year.

The company owns about 240 acres of land at the Buffalo site and has opened up a cut about 3 acres in extent and about 34 feet down, as shown in the illustration. An analysis of the rock from three test holes, is as follows from the overburden down:

Incline to Crushing Plant

Analysis from Davenport Site

	Water loss	SiO_2	Al_2O_3	Fe_2O_3	CaO	Mgo	Total	SiO_2:R_2O_3	
				Hole A					
Cover 1 and 2	8.72	73.60	10.93	3.17	1.84	.86	99.12	6.22	
Cover 3 and 4	7.19	74.30	12.08	3.70	2.06	.74	100.27	4.72	(Na_2 0.63)
1-13	37.65	10.74	3.42	1.52	43.52	2.89	99.84	2.17	(K_2 0.97)
14-25	36.37	13.28	3.63	1.41	41.51	2.52	98.72	3.63	
26-36	39.34	8.06	2.45	.98	47.41	1.67	99.94	2.33	
37-42	42.84	2.56	1.05	.03	53.76	.65	100.87	2.41	
				Hole B					
Overburden									
1-5	6.75	75.76	10.84	3.06	2.02	.74	99.15	5.45	
06.7	7.35	75.50	10.07	3.55	2.18	.74	98.19	5.23	(Na_2 0.33)
08.9.9½	33.16	19.50	5.09	2.99	37.31	1.65	99.60	2.41	($K_2$0.95)
1-10	38.15	10.22	3.87	1.31	43.61	2.56	99.43	2.09	($M_2$0.65)
11-20	37.01	12.96	3.66	1.58	41.51	2.45	98.97	2.37	($M_2$0.67)
21-30	37.88	11.42	3.60	1.20	42.79	2.68	99.57	2.38	($M_2$0.62)
31-40	41.47	4.74	1.96	1.12	49.43	1.89	100.61	1.54	($M_2$0.44)
				Hole C					
Overburden									
1-6	5.52	77.38	8.34	5.12	2.10	.74	99.20	3.75	
7-8	6.86	73.02	10.35	2.69	4.10	1.89	98.91	5.60	
9	26.03	32.00	4.19	1.79	32.76	1.54	100.31	5.35	
1-10	39.68	7.88	2.47	2.05	45.02	2 61	99.71	1.74	
11-20	38.48	10.38	3.23	1.27	43.97	2.22	99.55	2.31	
21-30	36.77	12.78	3.36	1.34	42.10	2.63	98.98	3.72	
31-40	37.99	11.20	2.65	.97	45.02	1.51	99.34	3.09	

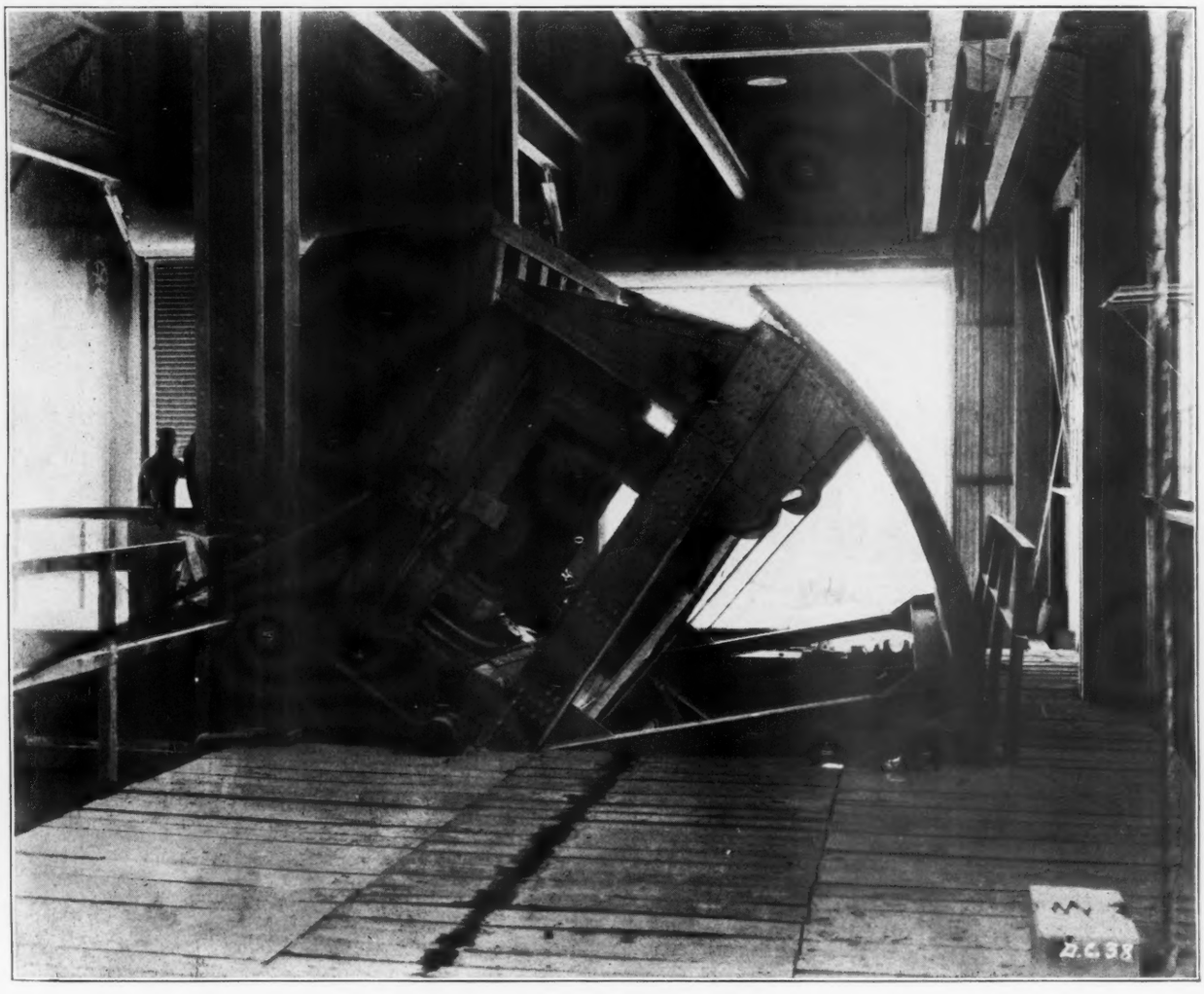
View of the Quarry, Showing Character of Rock

Handling Rock in the Quarry

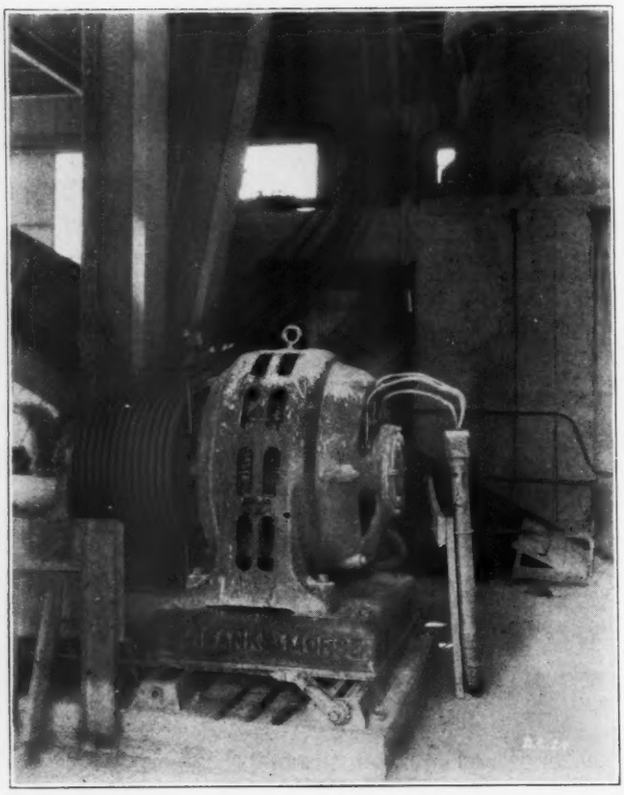
General Layout of Plant of the Dewey Portland Cement Co., Buffalo, Iowa

In general the rock is known as Cedar Falls limestone for the first 40 feet down, Upper Davenport limestone for the second 40 feet down and Lower Davenport limestone at the third 40 feet down. These three stratas form the basis of the future operations of the company.

In blasting out the rock, holes are drilled with two number 2 Keystone drills to a depth of 40 feet, spaced 10 feet apart and 20 feet back from the quarry face. Trojan non-freeze black powder is used for blasting, the amount now being used varying according to the conditions encountered. The rock is picked up from the quarry floor by a Number 100 B Bucyrus electric shovel equipped with



Tipple Dumping Contents of Car Into Primary Crusher



Rope Drive Motor to Crusher

a three yard Bucyrus manganese tipped dipper bucket which loads into an 8 yard side discharge Phoenix type quarry dump car built by the Eastern Car and Construction Company. The company has ten of these cars but at the present time is using only one. These cars are hauled 450 feet up an incline by a Worthington hoist drivn by a 200 h.p. Fairbanks Morse 2300 volt slip ring induction motor to a tipple designed by the J. C. Buckbee Company operated from the same motor.

This tipple is simply a platform revolving through an arc sufficient to unload the quarry cars into the primary crusher, the end frames carrying the bed and side frames upon which the car rests. This tipple dumps a fully loaded quarry car and returns to its original position in about 10 seconds. It is counterweighed in such a manner as to help the momentum of the hoist in overcoming the starting load.

Power for the entire plant is generated by two Edgemoor 900 h.p. waste heat boilers and one Edgemoor coal fired auxiliary boiler. These boilers operate two Allis-Chalmers 2500 K.W. condensing turbines and one auxiliary Allis Chalmers 200 K.W. non-condensing turbine as well as two Allis Chalmers 60 K.W. exciters for exciting the 500 h.p. syn-

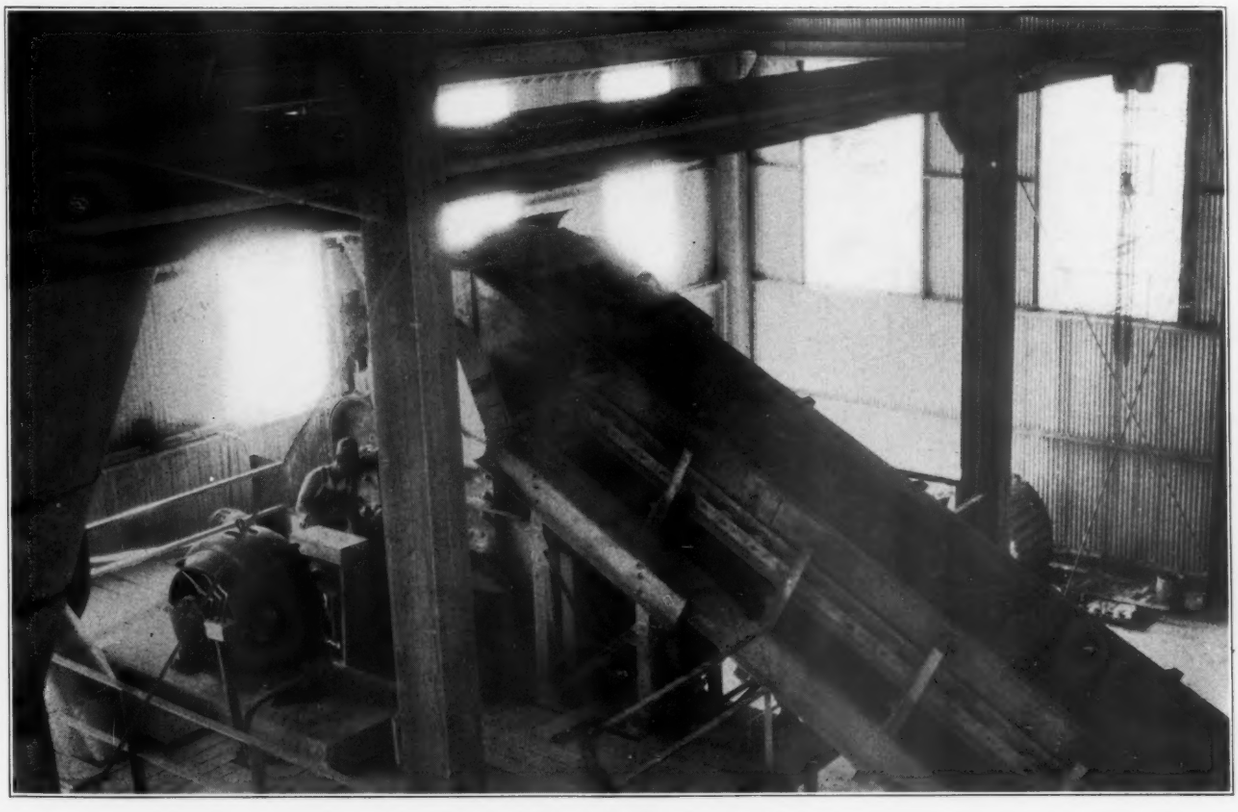
Looking Into Primary Crusher, Showing Method of Removing Boulders

chronous motors for the compeb mills. Power is generated at 2300 volts a.c. and transformed by means of a rotary converter to 440 volts d.c. Water for cooling is drawn from the Mississippi River which eliminates the expense of a cooling pond. It is made suitable for use in the boilers by an evaporation-condensing system designed by Griscom Russell of New York. There are two Elliot-Erhart condensers fed by two De Laval centrifugal pumps each driven by a 60 h.p. Fairbanks-Morse squirrel cage induction motor.

The rock from the tipple is dumped into an Allis Chalmers, Superior McCully gyratory crusher 42 inches between breaker plates driven by a 200 h.p. slip ring motor and having a capacity of 200 tons per hour. This crusher discharges into a concrete surge box feeding a 48 inch Webster pan conveyor on 48 foot centers driven by a 25 h.p. slip ring motor which takes the crushed rock to a 50 by 52 inch Gruendler hammermill of 200 tons per hour capacity driven by a 200 h.p. 2300 volt, 3 phase, 60 cycle, variable speed, slip ring, induction motor and this hammermill discharges on to a 30 inch 6 ply U. S. Rubber belt on 110 foot centers driven by a 40 h.p. 440 volt squirrel cage motor. This belt takes the material to a junction house where it is deposited on a 30 inch U. S. Rubber belt on 320 foot centers driven by a 40 h.p. motor. This belt takes the product to the crusher house which is a building 66 feet by 74 feet and 61 feet high where it is discharged into a 72 inch by 28 foot Galland Henning rollorless rotary sizing screen driven by a 25 h.p. motor. The sized stone is discharged by chutes into nine concrete storage bins of 150 cubic yards capacity each. These bins are arranged so that a belt passes under the center three bins upon which the rock may be taken to the screening house. However, the rock may, if desired, be by-passed to either of the outer three bins which have tracks beneath them and thus the company may ship crushed stone, although the entire crushed stone supply is now being used for construction and pavement in the plant itself.

The belt under the center three bins is 30 inches wide on 375 foot centers, driven by a 40 h.p. 440 volt motor and takes the material to one of two storage bins (depending on whether the rock is of high or low lime content) these bins having a capacity of about 15 cubic yards each. The overflow goes to the raw material storage building which is 100 feet wide by 400 feet long by 60 feet high. This building has 12 bins, six of which are used for rock, 3 for gypsum and 3 for clinker. Clay is stored in any one of the twelve bins which happen to be available. Not much clay is used as the rock itself has a high aluminum content.

Before going to storage the stone up to 2½ inches is further broken up by two Williams semi-vulcanite crushers, each direct connected to a 100 h.p. 440 volt motor. The material in storage is picked up by a 7½ ton P & H crane equipped with a two yard Williams bucket which brings it from the overflow piles over Webster reciprocating pan feeders to the aaw grinding mills which are not fed



Conveyor to Motor Driven Crusher

Two Kilns Now In Operation Showing Space for Intallation of Third Kiln

View In the Screening Plant Showing the Rollerless Screen

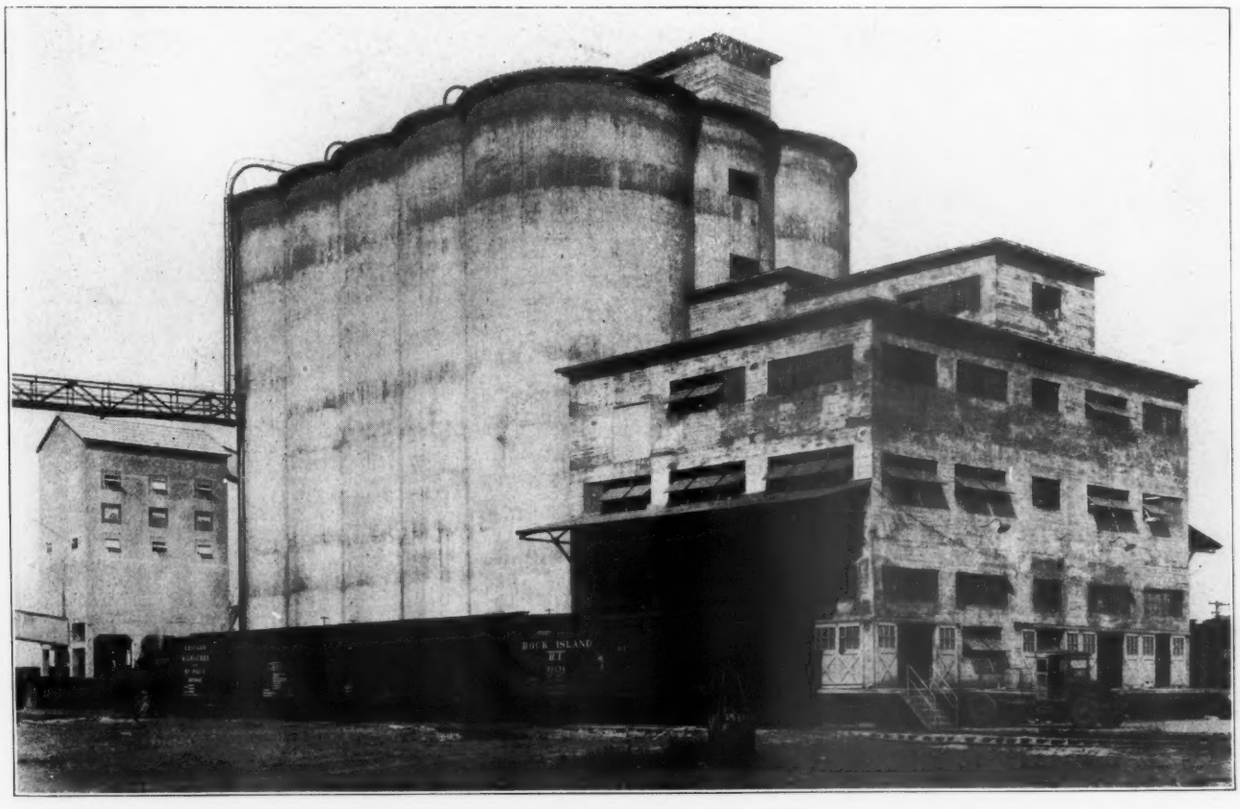
directly from the belt conveyor. There are two of these raw grinding mills in the 40 foot by 150 foot grinding mill room these being Allis Chalmers Number 726 compeb mills 7 feet in diameter by 26 feet long driven through Cutler-Hammer magnetic clutches by 500 h.p. synchronous motors. The slurry is discharged into a well and picked up by a 4 inch Wilfley pump driven by a 60 h.p. motor which carries the material to the slurry storage tanks. There are nine concrete slurry storage tanks 20 feet in diameter by 40 feet in height, three of which are reserved for correcting the product. The currected slurry is drawn off by two Wilfley pumps and delivered by two Ferris wheel kiln feeders, each driven by a 5 h.p. motor, which deliver the material to the kilns. There are two Allis-Chalmers kilns now in operation, each 11 feet in diameter by 175 feet long, and each driven by a two speed, 75 h.p. Fairbanks Morse motor through a Falk reduction gear unit and enclosed Link-Belt roller chain drive. The hot clinker is discharged to two Allis Chalmers rotary coolers, 8 feet in diameter by 70 feet long driven by 40 h.p. squirrel cage induction motors.

The kilns are fired by pulverized coal, dried in Allis Chalmers Ebro type rotary dryers 7 feet in diameter by 55 feet long, driven by 40 h.p. squirrel cage motors and fitted with balloon flues for dust collection. Coal is pulverized in three Raymond Impact pulverizers, each driven by a 60 h.p. squirrel cage motor and a Fuller Kinyon coal transport system conveys the fuel where desired. The pulverized coal is discharged through hoppers into a rapidly revolving screen which carries the fuel in air pressure suspension for a distance of about 500 feet to coal hoppers over the kil feed injectors. An electro pneumatic valve automatically controls the level of the coal in the bins.

The raw coal is discharged through a double track hopper and is fed by a reciprocating plate feeder to a Link Belt two roll crusher. The crusher discharges to a 24 inch belt conveyor equipped with an 18 inch diameter 26 inch face Dings magnetic head pulley. The belt conveyor discharges to the raw coal elevator that delivers to a bin for feeding to an 8 by 55 foot Allis Chalmers Ebro type dryer.

Three Ingersoll Rand 700 cubi cfeet per minute, two stage air compressors, driven by 125 h.p. synchronous motors and one 1050 cubic feet per minute, two stage Chicago Pneumatic air compressor, driven by a 200 h.p. motor furnish the entire compressed air supply of the plant, which includes slurry agitation, no mechanical agitators being used in the slurry tanks. Sly dust arrestors are used throughout the plant.

The rotary cooler discharges into clinker pits which project into the raw storage building. These pits are 25 feet long by 16 feet wide by 32 feet deep, one being under each of the two coolers. The material is picked up from these pits by the crane and carried to three concrete storage and cooling bins which feed direct through combined screw and reciprocating feeders to the two finish grind-

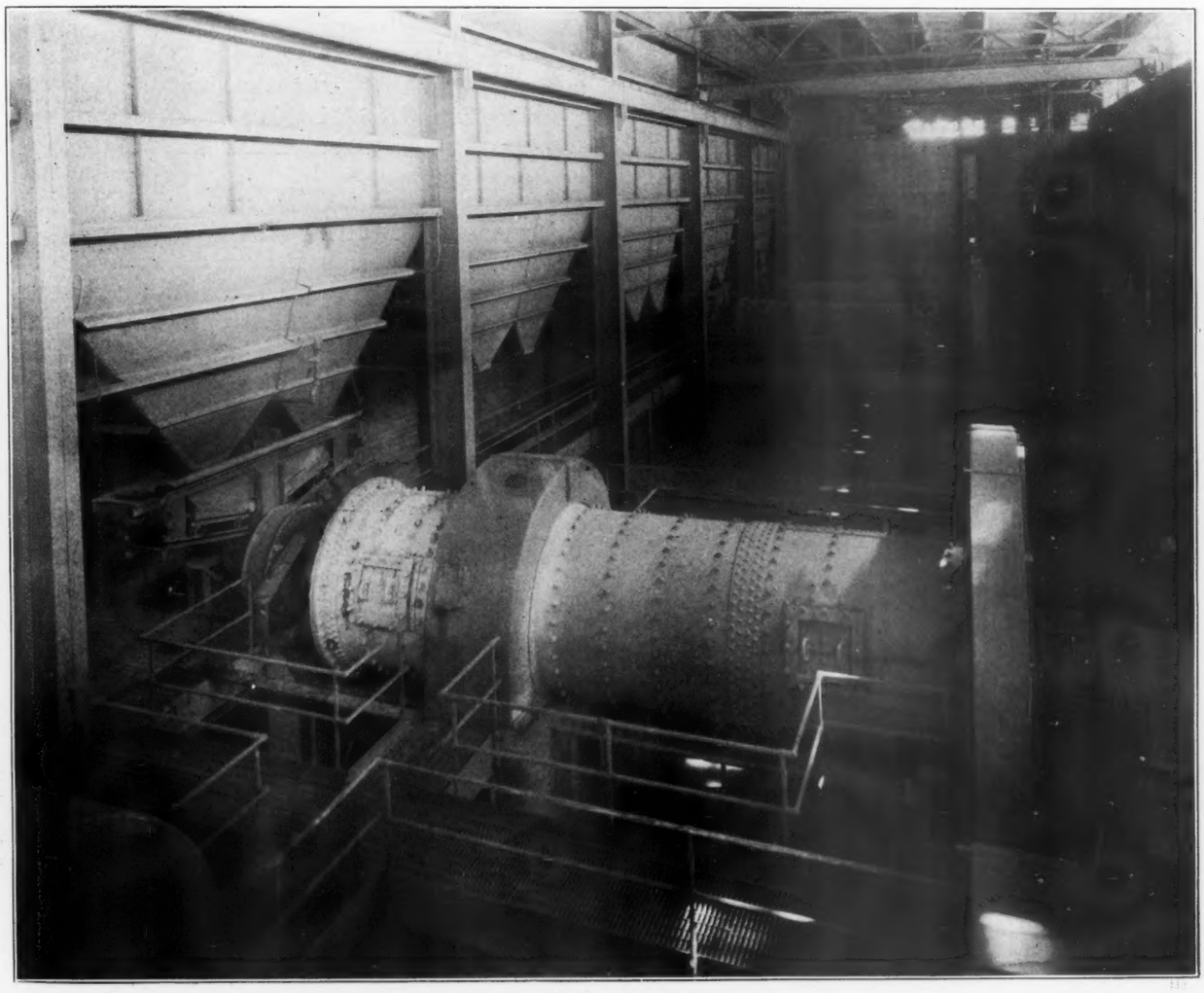


Storage Tanks and Packing House

Raw Storage Plant

Conveyor Belt from Coal Pulverizer

ing Number 726 Allis-Chalmers compeb mills driven by 500 h.p. synchronous motors. These compeb mills discharge on to 16 inch Webster screw conveyors 25 feet in length driven by 25 h.p., 440 volt, 1200 r.p.m. Fairbanks Morse motors which discharge into 8 inch Fuller Kinyon cement pumps driven by 125 h.p. motors which take the product 95 feet vertically by 275 feet horizontally to storage bins. From the storage bins the cement is chuted to four 12 inch Webster gathering screws 100 feet long driven by a 20 h.p. motor and is delivered to a 16 inch Webster cross screw 60 feet long driven by a 20 h.p. motor which discharges into two Webster bucket elevators driven by 20 h.p. motors to a 16 inch Webster screening screw driven by a 10 h.p. motor which discharges through hoppers into two Bates 3 tube packers. The packing house, which is next to the cement tanks is 50 by 66 feet and four stories high with basement. The sacked cement is hand trucked to cars on tracks on either side of the packing house or to the motor truck platform at one end of the packing house. There is a shop 72 by 122 feet of steel framework with concrete and brick construction. This shop houses a Ryerson-Conradson heavy duty engine lathe, a smaller South Bend lathe, a 48 inch radial drill, a 20 inch Rockwell drill press, a Number three Ryerson-Conradson milling machine, an Ohio heavy duty shaper, a Number 886 Buffalo electric forge, a Number 736 Green field pipe threading machine, a 500 pound Mayer power hammer, a Number 3 Williams pipe machine, a Number 4 Lennox serpentine shear, a number 4 Ryerson combination punch and shear, a Peerless hack saw, and miscellaneous smaller tools and machines. The machines in this shop are all individually motor driven and are served by a five ton, hand operated crane. Switch tracks give direct connections with the Rock Island and Chicago, Milwaukee and St. Paul railroads. The company finds a market for its entire production with a radius of 150 miles of its plant. The officers of the company are F. E. Tyler, president; H. F. Tyler, first vice-president and plant manager; W. E. Tyler, second vice-president and secretary, and R. W. Moore, treasurer. G. S. Parker is plant superintendent and had charge of erection of all machinery.



The Mill Room. At Left Are Bins and Reciprocating Feeders

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Connecticut Quarries Company Produces 750,000 Tons Annually

An error in one of the advertisements in the October 12th issue of Pit and Quarry gives the impression that the Connecticut Quarries Company, Inc., are producing only 250,000 tons of stone annually while in fact the combined production of their several plants is 750,000 tons annually. The production of the Mt. Carmel, Connecticut plant which was featured in the advertisement is 90,000 tons annually.

Third of Fire Loss Suffered by Farms

Agricultural America bears nearly a third of the national loss by fire every year. Seven of every twenty-four persons who die in fires are farm folk. Fifteen of every fifty-six dollars which goes up in smoke is farm money.

However, according to William M. Jardine, Secretary of Agriculture, the relation between farm and city loss in fires is not perfectly shown by statistics. The nation's total loss for 1926 was $560,000,000 of which $150,000,000 represents the farms' share. In adition to the actual destruction of property, it is pointed out, farm fires are responsible for the loss or ruin of supplies, the curtailment of agricultural production and subsequent reduction of manufactures. The farms' part of the total fire loss is, therefore, higher than the figures indicate.

Of the 12,000 people who died in fires last year, 3,500 lived in the country. The principle causes of farm fires, according to the department of agriculture figures, are lightning, defective chimneys, careless smokers, combustible roofs, spontaneous combustion, careless use of gasoline and kerosine and faulty electrical wiring or appliances. All but the first of these can be completely controlled; lightning itself can be rendered practically harmless.

Artificial Marble

An artificial marble composition consists of calcined magnesia, zinc sulphate solution, magnesium sulphate solution, and a mineral or resinous oil or agar-agar jelly or a solution of phenol-aldehyde condensation product. The proportions of the first three ingredients are as follows: ⅓ $Zn\ SO_4$ — 16.6 H_2O + 25 MgO + 1⅛ $MgSO_4$ — 14.8 H_2O. the fourth ingredient is mixed with one of the other three. Loading materials such as barium sulphate may be added, and a small quantity of sulphuric acid may be added to the mixture to remove traces of carbonates. Bia & de Bielize (British Patent 275,448).

Bituminous Concrete

A mineral aggregate is mixed dry with either (a) a cementitious material such as lime, Portland cement or plaster of Paris, or (b) a mixture of such cementitious material with stone or slag dust, with or without iron oxide. A bituminous soap is then added. For example, the aggregate is mixed with 5-20% of a powder consisting of 4 parts of Portland cement; 3 of lime or plaster, 2 parts of iron oxide, and 6 parts of stone or slag dust. A bituminous soap is made by mixing hot, 30-50 parts of bitumen and 2-5 parts of vegetable oil with or without resin, and saponifying with 20-40 parts of weak alkali lye. The soap mixture is used in equal or greater quantity as the powder L. S. Van Westrum (British Patent 275,364).

Analysis of Silicates

Porcelain mortars must not be used due to danger of increasing silica content by rubbing off of particles of the mortar. Steel mortars should be employed. 0.5 gm. substance and 4 gm. of soda are used for the analysis. Silica residues on porcelain dishes can be recognized on drying the dish and removed with NH_3. Sesquioxides must be filtered only on hard filters. Alumina will be found on evaporating filtrate with NH_3. Iron is determined by titration with iodine. J. Robitschek (Tonind. Ztg. *51*, 1112-15).

Quarrying

A machine for cutting rock or stone comprises a carriage movable on a track and having a spindle projecting laterally and supported by spaced bearings projecting from the adjacent and parallel side of a rigid frame extending from the carriage, the spindle being worm-threaded and being engaged by saw like cutters and interposed collars, each having only a few teeth. G. Jones (British Patent 275,412).

Influence of Sulphates on Cements

Potassium sulphate causes test pieces of slag cement to disintegrate. Portlant cement cubes are badly cracked. Aluminous cement is affected only superficially and partially. Calcium and magnesium sulphates show similar results except with aluminous which is unaffected. Sodium sulphate does not affect aluminous, while ferrous sulphates have no action on any of the cements examined. Anon. (Union technique du batiment et des travaux publics).

"The upward swing of wages in the construction industry is gradually losing its momentum and there is little likelihood of any further widespread major increases being granted building craftsmen."

HOW TO INTEREST MEN IN THEIR SAFETY

By W. P. Sabin
Secretary and Assistant to President, Ash Grove Lime and Portland Cement Company

I AM glad the subject assigned to me did not read: "How to *keep* men interested in their own safety," because the human mind is so constituted that we are *more interested in creating* than in *using* what we create. We are by nature explorers, inventors and creators. The green fields in the distance, the dim horizon, the unplumbed depths, the vast undeveloped resources about us, the untried, the untasted and the unfelt all beckon to us until we become restless and dissatisfied with our environment, our conditions and our possessions, and soon lose interest, wholly or to a degree, in the things with which we have become familiar.

We see this simply illustrated in the play of a young boy with building blocks. He will painstakingly build a house and immediately knock it down, in order to build another. In the natural functioning of this normal human instinct, when untrained and uncontrolled, we find the explanation of our variable interest.

Self-interest should lead a man to exercise every precaution to preserve his physical body intact. Fear of pain, pride in physical strength and personal appearance, fear of being a dependent on the charity of others, desire to maintain earning power, ambition to succeed in a chosen vocation, responsibility for the welfare and protection of a family, a sense of the unfairness to those who may have to share the blame or help bear the burden, and an unselfish desire to help others should be sufficiently motivating influences to keep every man constantly on guard against physical injury. These influences should operate naturally, and they will where men have been trained to *think*. The men who take the initiative in accident prevention, and are most active in carrying on the work, are the thinkers.

The benefits derived from thinking seriously about safety matters have been put in another way in the statement that educational safety work has been responsible for 75 per cent of the progress made in accident prevention. In view of this fact, it would appear that educational methods are worthy of a very large part of our attention. Such methods should be considered as appeals to reason and instinct. A man who knows no fear may be reached through his home affections, through his pride, his ambitions, or his instincts. Men do not live merely to toil; they live, as well, to play, and, as a rule, are easily reached and interested through appeals to their play, or sporting, instincts.

One of the objects of an educational safety campaign is to create and maintain *willing* interest.

"Some one said it couldn't be done;
Some one said that it could;
Everyone found that it was easily done,
When everyone said they would!"

It is much better to have the whole-hearted support of an employee than to have the half-hearted cooperation which results when you compel a man's interest. What we want is real interest and a man cannot be really interested in something he knows little or nothing about and in which he does not have a willing, active part; therefore, he should be interested, informed and given something to do.

It would appear from this premise that the responsibility for the initiative rests with the employer, and this fundamental principle has been fully and repeatedly demonstrated in my company's experience, extending over a period of twenty years. Due to the inherent personal injury hazards of our business, to the human element, to the absence of mechanical safeguards, and to the inexperience of the staff in the prevention of accidents, our early accident record was not one of which to be proud. However, very early in our operating experience the management saw the need of doing something to protect our men against personal injury.

About this time, our legislators conceived the idea that personal injury accidents could be prevented by legislation, and so they filled our statute books with laws, expecting to legislate accidents out of existence. Like many others, we accepted the idea and spent much thought, time and money equipping wheels and shafts and gears, and other dangerous equipment and places, with mechanical safeguards. This was a good safety step but we have since learned it only went about a fourth of the way. An enclosed screw conveyor did not keep one of our night-shift men from falling into it, after he had removed a section of the lid and dropped off to sleep while sitting on the edge of the box.

A belt and rope, left hanging on the wall, did not save a workman from suffocation in a rock tank; and the track anchor, left hanging in the cab, did not save one of our engineers from death by scalding when a locomotive crane tipped off a fifteen-foot trestle.

I could tell you of other similar instances, but those mentioned will serve to emphasize the relative unimportance of such devices where the individual has not been sold and trained on safety first. We soon discovered the fallacy of the effort to legislate accidents out of industry and turned to the really effective method of preventing accidents: namely, interesting and educating our men to the importance of constantly thinking in terms of safety first. Due to labor turnover and other difficulties

attendant upon efforts to maintain steady interest, this was not, nor will it ever be, a small job, but we feel we have made some progress, since, with a force of 300 men and a plant comprehending every operation from stripping in the quarries to loading the finished product into railroad cars, we have had only one lost-time accident since March, 1926. We tried many plans and methods and made some progress before the improvement was notable, but we kept at it persistently. We put up posters and warning signs; we had safety committees; we had a dummy figure which climbed a ladder—one step for each day without a lost-time accident; we had barbecues; we had mass meetings on the plant lawn in which prominent outside safety workers participated, and we finally went a whole month without a lost-time accident.

Then, we organized a safety court, with Judge, Prosecutor, Sheriff, and Jury. In this court, any employee could prefer charges against another employee for any infraction of safety rules or disregard of personal safety. The accused was permitted to choose his own attorney from among his fellow employees. Court sat one night each week and was open to the public. We were striving at this time to get all of the injured to report for first-aid. We made progress, but during the life of this experiment we had two lost-time infection cases which were due to failure to secure first-aid.

During the twelve months following our no-accident month we conducted a Safety-First and First-Aid campaign, stressing the danger of infection in small cuts, scratches and nail punctures. The plan and result of this drive is described by our efficiency engineer, Harold E. Williams, in a paper read at a district meeting of the National Safety Council in Kansas City, Missouri, last March. He said:

"During this period, the lost-time accidents gradually decreased until the last three months, in which time we had no lost-time accidents. However, the total number of accidents reported also dropped, showing that either our total accidents were growing less in number or that, as was suspected, only the number of the more serious accidents was on the decrease. On the latter assumption, another safety drive was inaugurated, this to start July 1 and end December 31, 1926.

"One noteworthy feature of this drive over anything that had been previously done was the executive work of the committee in studying the effects of different kinds of propaganda. As a result of this study, it was decided that although the posters we had been using had their effect, they lacked punch because they did not apply specifically to our local conditions and thus had no personal appeal.

"In an effort to overcome this deficiency, a large board was erected, across the top of which were nine white bulls-eyes, with an electric light in the center of each one for night display; the first three for April, May and June, the months just past in which we had had no lost-time accidents, and the last six for the succeeding months to the end of the drive. The light and bulls-eye were to change to red for any month in which we had lost-time, the others to remain white as before. At the bottom center of the board were the date numbers, which were to change to red in the same manner. In the center were placed the two hands of a clock, one pointing to the date, the other to the month. To the right and left of the numbers indicating the day, were placed two bulletin boards, one for general safety suggestions and cautions, the other for local items only. The local items were to call attention to safety infractions by individuals. These were obtained from reports made anonymously by a local secret service from within our own organization, after which they were edited and placed on the bulletin board. These bulletins were generally in the form of tactful ridicule, without disclosing names, although in a few instances, where the offender was persistent, the names were given and a bit of the tact removed from the ridicule.

"By this system many unsafe practices were eliminated. At first this was due undoubtedly to the individual's horror of being ridiculed, and later to his change of viewpoint, caused by environment; he, not knowing who belonged to the secret service nor at what time he would be reported for an unsafe practice, began to take stock of his own indiscretions."

From the standpoint of lost-time and decrease in total number of accidents reported, this six-months safety drive was quite satisfactory, but there were two minor cases of infection, with no lost-time, but nevertheless showing that we had not yet succeeded in getting all accidents reported, and so (quoting again from Mr. Williams' paper):

"It was decided to divide the employees into four teams; each team to have a captain in the plant and a lieutenant in the quarry. Each team also had a color, a name, and was represented by a wood image of a mule. These mules were placed on a wooden race track on the front of the safety board. This track was divided into 186 spaces, thus making six spaces per day for a 31-day month, the spaces per day remaining the same for any month, regardless of the number of days in the month.

"The rules of the race were as follows:

"First—For any team without an accident for any day, the mule representing that team would advance six spaces.

"Second—For any employee sustaining an injury drawing blood, and receiving first aid, five spaces would be advanced.

"Third—For any employee sustaining an injury, not receiving first aid within thirty minutes, an advance of only one space would be made.

"Fourth—Every month was to be a heat, and every year a race, there being a prize given the

team winning the race. Each member of each team, was given a button of the same color as the mule representing his team, which button was to be worn at all times while at the plant.

"Each man was personally interviewed by the captain of the team to which he belonged and given the following instructions:

"First—To get first aid for all wounds, regardless of how small, the explanation being that any wound, puncture, splinter, or anything in an eye is a potential case of infection and must have treatment within thirty minutes, this limit being based upon the efficacy of iodine.

"Second—To report to the first aid station anyone sustaining an injury, without first aid, first calling the individual's attention to the fact that he should receive treatment.

"After a few days under this system, it became apparent that a court of last appeal was needed to pass on disputed cases where first aid was not administered. Our assistant superintendent was chosen to act as judge on such cases, and very few have come before him in disputed cases that have not lost their case, his assumption being that they were guilty of not seeking first aid or they would not be there, and this seems to be the correct attitude for the majority of such cases.

"The following figures show that this system had at last accomplished what at times has appeared impossible, viz., getting the men to report for first aid.

"The month before putting this system into effect, we had five men report for first aid.

"The first month under the new system, 68 reported—11 failed to report within 30 minutes.

"The second month, 73 reported—9 failed to report.

"The third month, 126 reported—3 failed to report.

"While a large part of this record is due to competition direct, we believe the greater part is due to change of viewpoint and will eventually be due entirely to this change. As a concrete example of the effect of environment in an effort of this kind, I will point out the instance of one man who sustained a slight injury and refused to get first aid on the ground that it was 'all foolishness.' Since this first offense, he has never failed to get first aid, as he found his viewpoint was very unpopular with his associates."

While this may appear to have been a drive to secure prompt reporting for first aid, the effects of the campaign were much more far reaching and were undoubtedly due to the interest created. Just how effective it has been may be gathered from the following comparison:

In 1925, we had 20 lost-time cases, which resulted in 163 days of lost-time at a cost of $1.13 per hundred dollars of payroll.

In the first three months of 1926, we had 11 lost-time accidents and 54 days of lost-time at a cost of 5c per hundred dollars of payroll.

Since March 31, 1926, we have only had one lost-time case with 16 days of lost-time at a cost of 0.126 per hundred dollars of payroll.

This improvement we attribute to three things:

First: Creation of interest.

Second: Steady maintenance of interest.

Third: Prompt reporting of injuries, thus permitting first-aid in time to avoid lost-time.

Recognizing the necessity of keeping the fires of enthusiasm burning, the committee in charge of our safety work planned to have a monthly contest in connection with the mule race, and at the end of the April heat the winning captain challenged the captain of the third team to a contest in horse-shoe pitching. At the same time, the captain of the second team challenged the captain of the fourth team to a game of marbles.

The horse-shoe pitching contest proved to be quite an exciting event. The game of marbles started off a little slowly, as neither contestant had shot a marble since his boyhood days, but as it progressed the contestants became more skillful and toward the end of the contest each was able to hit a marble after ten or fifteen minutes of earnest effort. The result of the game was perhaps due more to endurance and determination than to technical skill.

At the end of the May race, the winning captain challenged the captain of the third team to a game of baseball. The game was umpired by the captains of the other two teams. This was a fast and exciting game. At the end of the second inning, when the excitement was running high, some of the spectators conceived the idea of "egging" the umpires because of unfair decisions and favoritism, and the plot was executed with wet asbestos.

Three of these contests were held at the noon hour, making it possible for most of the men to attend. The baseball game was held at 4:30 p.m. and was attended by every man who could be spared from his post of duty.

Many of the plans and methods we used were temporary in character, as such plans and methods must be if interest is to be maintained, but a few have been of a more permanent character, and, in fact, are still in use, to-wit:

We have always striven to impress upon the minds of new employees the hazards connected with their work, and with the importance of unceasing vigilance against accidents. At the time they are employed men are especially anxious to please and the necessity for working safely can be more easily impressed upon them when their minds are in this receptive condition.

Quite a number of years ago we adopted the plan of making our accident prevention work a section of our semi-monthly foremen's meetings. We had

established the practice of having the foremen get together for a conference, dinner, and entertainment at the close of the day. At first, these meetings were held every two weeks but latterly, due to improved conditions, they have only been held monthly. It was our idea that by making our staff of foremen and department heads our safety committee we would be more likely to reach and interest all of them, and through them the individuals in their respective departments. The plan worked so well it has been continued for years without question.

In addition to this general committee, there is a sub-committee composed of three men, which is changed from time to time. Their job is to make a periodical, general inspection for unsafe practices and conditions.

We also learned through our own experience, and by observing the experience of others, that "good housekeeping" is an important factor in keeping down accidents, and therefore we inaugurated some years ago a monthly Clean-Up Contest. The results have been so satisfactory we have never felt like discontinuing it.

Another thing that has contributed to a better showing on accidents has been our physical examination requirements. Every man who seeks employment with our company must submit to a thorough physical examination by our plant physician and surgeon. This enables us to reject the applicant if he is unfit for any job we have open, or, if we can use him, to place him where he can work safely so far as his physical defects are concerned. Subsequent examinations are made yearly, semi-yearly, or more frequently if necessary, in order that any serious physical defects which have developed may be caught.

We believe that these plans have been successful because they have had the willing support of the men. They have benefited from the physical examinations, they benefit from, and enjoy, the monthly Clean-Up Contests, and the safety section of the foremen's meetings has always been full of interest.

Let me repeat, "The responsibility for the initiative rests with the employer." In order to secure a man's interest in safety, the employer must put a premium on safety, and definitely line up with safety in such a way as to appeal to and engage a man's attention and interest. A man thinks of the thing in which he is interested, and if he thinks safety he will work safely.

The employer must *show his interest* by providing proper mechanical safeguards and safety devices, by adopting and insisting on safe practices, and by keeping the spirit of safety alive in the minds of his men.

The problem of interesting workmen in their own safety has been successfully solved in various ways by many industries and employers of labor. There is no *one*, royal way—there are *many*, and they vary in effectiveness according to the time, the place, the mood, the environment, the number to be reached, the method of presentation, and the personality of the leaders. However, any plan presented should be carefully analyzed before attempting to carry it out. A plan that will work in one place may not in another. A plan that will work with ten men may not be at all suitable for a hundred men. An idea that will appeal to a hundred men may fall flat with five hundred. That is not all—a plan that would "go over" fine with one group of 500 men may have absolutely no appeal in another similar group.

The greater portion of our industrial safety effort today is spent in organizations of considerable numbers. With a large group of workers, the limited time and opportunity, and the impossibility of sufficient personal contact with each man, we must resort to group and mass work insofar as the main body of an organization is concerned. Key men can be, and should be, labored with individually. They in turn can pass the information and enthusiasm and spirit along through subordinates, sub-formen, and gang bosses to the individual workers. But individual work must be supplemented and supported by plans and methods which in their presentation and execution will have group and mass psychological appeal, such as committee meetings, safety publicity, bulletin boards, slogans, suggestions, safety rallies, sport contests, and general educational work.

The real wide-awake, sincere foreman, the type that feels in his heart that he is responsible for the safety of his men, is an extremely important factor in getting and keeping workmen interested in accident prevention, and the principal safety committee should consist of foremen. The foremen should be held responsible for accidents in their respective departments, and should see to it that a committee of one or more workers is appointed or elected to function in each department; this committee to work with its foreman and to be changed every thirty or sixty days.

This may be the means in many cases of changing the attitude of a worker from one of antagonism to one of friendliness, for as soon as he feels a responsibility for promoting safety, he becomes interested and an active booster. While the various measures used seem more or less temporary in character and benefit, they are cumulative in effect and the ultimate result will be the formation of the *habit* of thinking and acting safely under all conditions and circumstances.

The work of an active safety committee is always noticed. We see them when they make their inspections, and also see the results of their inspections in safer jobs and cleaner working conditions. Furthermore, as already pointed out, a man who has been on the safety committee makes a

better and more careful workman, for he has not only been obliged to think, act, and live safely, but his experience in safety work has educated him to its importance.

Safety First is not a movement that will continue indefinitely from its first momentum. We must keep it vitalized by feeding it new ideas, and since it is a psychological law that thought, sooner or later, passes over into action, it is important that all our efforts should be of a constructive nature, and of sufficient frequency to favorably influence individual behavior. According to a Spanish proverb, if you live with wolves, you will learn to howl. Let us add a safety first proverb to our accident prevention literature:

Live with Safety-First enthusiasts and you will learn to be a Safety-First booster!

Quarrying Rock With Safety

The safe handling of rock is a subject which should interest every quarry operator. In the September issue of the National Safety News, R. E. Colville, Assistant Manager, Plant Service Division of the United States Gypsum Company, makes some interesting pointers to remind quarry men that safety pays.

The most important factor for safety is for employer and employee to have their minds on the seriousness of the operation and allow no horse play. Face of rock should be inspected often, especially in the spring of the year and after rain, for loose rock. Rock may become loosened by blasting, frost, rain or shock caused by vibration of large drills. In the secondary drilling on large blasts, care must be taken not to dislodge stones by dragging air hose over rock or baring rocks on workmen below. Drilling should never be down within two feet of a misfire. Yard area and loading tracks must be kept clear of loose rock and always be neat and orderly.

Lighting in a twenty-four hour operation is a very important factor. Floodlight method is superior to individual lighting, when practicable. Crane and cars, as well as working face, should be well illuminated. In loading by hand workmen must never leave stones in rear of them, as they are liable to fall over them when they step backward. Tools must always be placed, not thrown down haphazardly. The working face must be so kept that no loose stones will roll down and jam hands or feet between rolling stones and stones on floor. Cracked stones or stones too large must not be handled, as severe bodily strains may result.

In handling bars, picks, hammers, etc., flying rock chips result in a large percentage of eye injuries. These hand tools can be used without interference to fellow workmen when handled carefully, with assurance that the tools are in good condition. When gangs of men are loading into the same container stones should be cast and not placed by hand. The hands should never go within the sides of the container except when suitable warning has been given to fellow workmen.

In shovel loading the operator must be ever alive to the location of the employees assisting operation. The shovel should be always so placed that the operator is next to the cars being loaded to give the full view of the operation. Men must never be allowed under swinging dipper nor should operator allow dipper to be suspended in the air when machine is idle. Extreme cars should be taken to have cars well loaded so that no material overhangs the sides or is placed so that it will be jarred or bumped off in transit.

Stones too large for loading should be placed in the rear of the shovel to be broken up at regular blasting time and loaded immediately, or so placed that they can be picked up on the next shovel cut in loading. The thorough inspection of crane equipment, especially cables and chains, before starting work is most essential. Cranes should be kept neat and free from grease to prevent fire. A suitable derail must be placed on all inclines and under no circumstances should men be allowed to use the incline for a walkaway.

Origin of Suggestion Systems

Back in 1894, John H. Patterson, of National Cash Register fame, asked an employe of his organization: "Why not make your suggestions in writing—if only to show your foreman you are capable of holding a better position?" To which the man replied: "What's the use? If I did, the foreman would take all the credit." This pointed reply caused Mr. Patterson immediately to set up and put into operation a system whereby his employees might make suggestions which would benefit not only the company but themselves, and it is this incident that is the accredited origin of all present-day suggestion systems.

Since that time, countless institutions have organized suggestion systems with the result that, like undeveloped water power, the ideas of the man on the job have been harnessed and turned to productive use instead of being allowed to go to waste.

Indeed, a healthy, thriving suggestion system is one of the best possible evidences of satisfactory employee relations. Where a suggestion system flourishes there must also be mutual confidence between management and men, plus able foremanship, manifest interest on the part of the workers in both production and economy, an effort toward reduction of accident hazards, and a high quality of workmanship as well as of product, since all these are but the natural concomitants of a well ordered, steady moving suggestion system.

SETTING AND HARDENING OF CEMENTS

By Prof. Dr. R. Nacken

IT HAS been possible through the support of the Society of German Portland Cement Manufacturers to bring the Roentgen apparatus equipment to a high state of perfection and to attain high temperatures up to from 250° to 300° C. (482° to 572° F.), making it possible to conduct a series of investigations at these temperatures. Reference is made to the question in connection with these investigations as to whether admixtures in the form of mixed crystals have an influence upon the property of cement. These investigations have not yet been concluded and are at the present still going on.

It is difficult to apply roentgenographic methods of examination to the silicates contained in cements. They contain elements of low atomic weight which leave only traces on roentgenographic examination and consequently often lead to false conclusions. Calcium oxide is to be examined by itself and examples of how the interference views originate are shown. The diagrams of cement show that free lime is still apparently contained in cement as the radii show an agreement. The question as to whether iron plays a role in cement was examined. Calcium ferrites can be prepared in very beautiful crystals and the compound in the proportions Ca : Fe : : 2 : 1 and 1 : 1 appear especially fine. Such compounds, however, can not be found in cement. The iron is mixed in some one way or other with the calcium aluminates of the cement. Iron, apparently, is not of any significance as far as the hardening and setting is concerned, but it is so in the production of clinker by bringing about a lowering of the sintering temperature.

The question as to how the hardening takes place is interesting. Reference is made to nature taking as an illustration conglomerates. Many indications are found in the agglomeration of rocks by a process of cementation based upon a process of glueing together. This cementation of crystals can be conceived as taking place by the action of the unsaturated powers of valence upon the surfaces of the crystals. A colloid chemical consideration of the degree of division of matter shows that the surfaces increase very rapidly with the degree of division. In the case of the setting of cement gelatinisation certainly plays a role. The conditions present in coagulation with addition of electrolytes is involved. These have the property of bringing about the combination of the sols with negative particles to form gels with small molecular groups. When salts are added the electrical equillibrium is disturbed and neutralization takes place.

Under certain circumstances, however, reversals can occur, thus many sodium salts have a lubricating and deteriorating influence. These occurences are dependent upon the incidental properties of the dispersive system. A series of experiments has been carried out in order to ascertain the behaviour of different cements in suspension in a colloid chemical sense. A normal Portland cement from Dyckerhoff and an Electro-Alca cement were examined. On the first agitation the normal cement settled to the bottom rapidly, but the supernant liquid showed opalescence. Electro-Alca cement settles much more rapidly but the supernatant liquid remains clear. This behaviour can be explained by the fact that ordinary cement contains but few calcium ions while in the Electro-Alca cement they are numerous and the flocks become much coarser. Normal cement takes up water more slowly than the Alca cement, whereas after settling the Alca cement increases in volume much more rapidly. Furthermore, ordinary cement, in contact with water and saline solutions shows but slight efflorescence, Alca cement, on the contrary shows numerous visible crystals of calcium aluminates. The clinical composition of these calcium aluminates is difficult to determine as their amount is very small. An idea as to their composition can be gotten at only by the study of the solubility, this being now under way and it is hoped that this will bring about a solution of the question.

Further researches upon Portland cement dealt with the behavior upon the addition of calcium chloride. The rapidity of setting was at its optimum in the case of an addition of 0.5 grams, slower with 1.0 grams; in case of 3.0 grams the result was the same as in the case without any addition as far as the setting was concerned. Curves again showed the influence of the electrolyte which at the outset is dependent upon its concentration. A second series of experiments was carried out from another point of view. The combination and the loss of water were examined. Here, again, good results could be obtained by the use of the torsion balance. There appears a possibility of explaining the peculiar phenomena associated with the setting of cement through a further study of the influence of the addition of electrolytes.

The Harris Granite Quarries Company writes "we are very much pleased with Pit and Quarry in its new size and have found your articles quite interesting. We think you are turning out a splendid magazine for quarry use."

WHEN FELDSPAR MINING IS PROFITABLE AND WHEN IT IS NOT

By George E. Wilkes

DOTTING certain sections of Connecticut, New York and the Carolinas are hundreds of abandoned holes that started out to be feldspar mines. Some of these still have potential value if properly handled while many never had any commercial value as far as the production of saleable crudespar is concerned, and this easily ascertained fact might have saved their over-enthusiastic owners much time and money had they not been blinded by dreams of "easy money."

The profitable mining of feldspar is a business calling for a high degree of technical knowledge and practical experience and like most businesses, its failure or business mortality rate is determined in a large measure by the operators possession or lack of these essentials. Lack of capital has also been the cause of many unprofitable operations.

Figue One

Many times these operations are started by farmers and laborers looking for something to do in the "off season" to pick up some "easy money." They may own or rent a piece of land in the feldspar region that has outcroppings of rock that intrigues them into thinking about starting a mine and from then on their enthusiasm throws aside all caution. Instead of having a competent engineer or geologist look over the proposition they will pick off the best looking sample of rock and send it to some company that buys feldspar, asking if they will buy it and if so, at what price. Naturally enough, they get a prompt answer stating the company can use, say, 10,000 tons a year at a price of from $7.00 to $8.00 a ton. There may not be a bushel basket of the sample rock on the property and it may be necessary to mine 100 tons to get that bushel but this does not seem to dampen the ardor of the true enthusiast. "Well, lets see,"

A Fine Sample But the Deposit Has No Commercial Possibilities

he says, "fifty tons at $8.00 is $400. Joe and I can do that in a couple of weeks and net $200 apiece. All we have to get is a couple of shovels, a wheelbarrow and some dynamite and we're all set."

So they go to it and in a few weeks there is another abandoned feldspar "mine." All of which naturally raises the question of whether or not it is possible for the "little fellow" to make money in mining feldspar. The answer to that depends in part, of course, on what sort of "little fellow" we are dealing with. If he has enough business knowledge to figure out what his feldspar is costing him to produce and is willing to work diligently and intelligently he may make a "go" of it. Here are some "tips" that will help him along.

1. Have a core-drill test made. This is not an expensive proposition and may save thousands of dollars spent in working a deposit that never had any commercial possibilities to start with. The fact that a piece of land has outcroppings of feldspar rock doesn't guarantee that it is a commercially workable deposit.

2. Remember that the sample of feldspar you send to the company who is going to purchase your output is a sample of the product you are going to deliver and that if you pick out a fine sample and

Figure Two

then deliver an inferior run-of-mine product your shipments are quite properly going to be rejected—at your exepnse! The best way is to get some engineer to tell you how many tons of rock it will be necessary to mine to produce a ton of given quality. Then send a fair sample, picked at random, of that given quality to the prospective purchaser.

In Figure one you will see what it means to pick the wrong sample. Here is as fine a sample as one could find and one that would cause investigation from any feldspar buyer. The fellow who mined this thought his fortune was made but investigation showed that he would have to get $200 a ton to make it pay! It was just a crystal in a wall of biotite or black mica where one would have had to move hundreds of tons of rock to get a single carload of commercial spar. Yet this man spent several thousands of dollars before he abandoned this deposit. A few inexpensive preliminary tests and a little plain arithmetic would have shown him the deposit had no commercial possibilities.

Figure two shows the start of a mine that looked very promising and, in fact, from which several hundred tons were mined at a profit, but the optimism of the miner carried him on long after the profitable part of the deposit had been worked out and until the operation as a whole showed a loss of several thousand dollars. An inexpensive core-drill test would have shown him the depth of the deposit and saved him all this unnecessary loss.

Figures three and four show a mine that three different owners failed to make a success of, yet when taken over by a company that had experience in the field and adequate knowledge of geological formations, this mine proved to be one of the best in the country and still produces thousands of tons of the best spar to be found anywhere.

3. Figure your costs of production, including haulage, accurately. The writer knows several operations that showed a profit at the mine but lost out when it came to F.O.B. the railroad track, which is the point from which the price of your product is fixed by the buyer.

4. Maintain the quality of your shipments to grade of sample. Lets suppose we have made a core-test, have a good deposit, good haulage and have sent out several shipments at profit. We know what the company that buys our product wants. Do they get it? Not always! We may have over in one part of our deposit a wall of rock that is almost, if not quite, as good as the feldspar we have agreed to ship. "We will put in a few tons of this, that can be easily mined, to help the general output," says the inexperienced miner. That's the biggest mistake a feldspar miner can make, especially a beginner. The writer has been in every stage of this business, from prospecting to the making of finished pottery or ware and can testify that if you think you can get away with a spotty spar you have another guess coming. It can't be done, so don't try it. The fact is that 500 pounds of bad spar will often spoil a whole carload of what would otherwise be A No. 1 spar, for the bad spar will impregnate the whole carload. As assistant superintendent of a large tile plant the writer has thrown thousands of feet of tile in the dump just on account of a little black speck on them produced by spotty spar.

Today the tendency of the best grinding mills is to test every car as it comes into the yard and then test the material after it has been ground, sending a fired sample to the consumer. If the feldspar miners product does not come up to the grade of the sample he will soon lose out with that kind of buyer and losing out with one buyer usually means losing out with all of them as there are few buyers and they generally know what the other few are doing.

4. Another reason for the failure of the inexperienced feldspar miner lies in the system of cobbing, or breaking off bits of mica or other foreign material from what is otherwise a good piece of spar. This requires a skilled and conscientious workman

Figure Three

and usually it does not pay because such workmen are not to be found. To do a good days work of cobbing is about as difficult as anything in the feldspar business. When a deposit is so low grade that from 30 per cent to 50 per cent needs selecting, it does not pay to work it, at the present scale of wages, unless one has enough capital to buy a crusher. With a crusher feeding a belt which passes over a table where two men can pick out the best pieces such a deposit may be made profitable. Where then is the solution? Store all the low grade product in some place where it may be later picked over when you have capital to purchase a crusher and handle it profitably. The writer does not advocate throwing such material away. Sometimes a spar that is just a little inferior to the standard can be sold for a number two grade. While this quality is not very much in demand, if one has a

Figure Four

good supply of the standard grades for sale he is then more apt to dispose of a second grade than the fellow who has nothing but this quality alone.

5. A big mistake often made by inexperienced miners relates to the way they use dynamite in blasting. The novice seems to think that the more dynamite he can get into a hole, the more rock will be blasted out. This may be true, but how much is it going to cost to handle if the blasting charge used is so heavy that the rock is spread all over an acre of ground? That is one important question to consider. Also how much of the stone will be big enough to ship after it is gathered and handled several times from mine to mill? It is the writer's experience that buyers prefer to do their own pulverisizing and prefer to buy the material in large pieces. For a deposit of good crystal spar a 20 per cent dynamite is recommended and not over a 40 per cent dynamite should be used for graphic spar or spar mixed with mica. Do not overload the drill holes but rather place the charge as near as you can, even if it comes out in chunks and you have to pop-hole or mud-cap the large pieces. It will save you much more in material gained than the cost of the extra work, as the better the grade of spar the more brittle, and by watching the operation of breaking up these large pieces carefully you will also save money in handling. Nothing pleases the buyer more than a carload of large sized pieces and it means cleaner material, too.

6, Some general considerations might be well to point out. If one wants to start in mining feldspar and has a promising vein, I would advise them to write to some dealer, who will send a representative to look it over. This will give you an idea of what you have, and unless one wants to mine for themselves, I would advise leasing the deposit to some reliable concern, but, if you do want to go into the business, be prepared for a lot of disappointments, as one must be an optimist in this field.

No one can tell what you will get. Feldspar is like gold. It is where you find it. As Prof. William North Rice, one of the best geologists in the business, once told the writer, "I have yet to see the first man who could look through more than two feet of solid rock."

I have had dozens of professors from almost every college in this country, come to the different mines I have operated, but they generally come to learn what you have found, rather than to tell you what you will find, and the only way you will find feldspar, is to dig for it. However, one can get a fine idea from a core drill test, as to what to expect.

The writer knows several deposits that have a potential output of thousands of tons, that were opened by someone, who through lack of knowledge, moved just enough of the top layer of the ledge to give some one who knows a pretty good idea of what to expect, whereas if they had spent a little more time in the workings, would have had a good mine.

Most of the deposits that are available today require capital to operate them. The writer has often wondered why some of the big contractors who have idle machinery in slack times haven't tried the game, and opened up an avenue for a good business as there are many side issues or by-products that would return a good profit.

Having your deposit and wanting to get started, the best thing to do is to dig down as deep as you can, drainage permitting, and find out if the quality improves with the depth. Most any good deposit shows better spar as one gets deeper.

Find out how much overburden you have to remove to get to the ledge or vein, and find out the distance between walls, or the width of the deposit. Sometimes the vein will be so narrow that one cannot work enough men to make it pay good returns.

If the vein shows a good quality of feldspar, and a good working face, the best bet is to have a core drill outfit make a boring or so before one spends too much money, as one will find it better than doing things blind for a month or so, and then perhaps getting disappointed.

A big per cent of the abandoned feldspar mines that have been started wrong will become profit makers. It won't be done by working over the refuse dumps, as they are doing some of the old gold mines, but by someone commencing where the other fellow has done most of the prospecting and left a floor under which there are thousands of tons of good spar awaiting the right party to open things up.

It is a wonder to the writer why none of these live wire promoters haven't exploited this field, as there are far more possibilities for profit than a lot of oil wells and gold mines. If the American public ever wakes up to the fact that they should eat off American dishes, bathe in American bath tubs, and walk on American made tile floors, made from American produced feldspar, there will be a great demand for this commodity.

Now there is one more question that will be asked: What is the present demand for good feldspar?

It has never been a drug on the market, but there are thousands of tons of poor spar, laying where it was mined.

Feldspar is also a product which can dispose of in twenty car loads, easier than one carload, as the buyers like to have a uniform product they can rely on, and this cannot be attained by buying a carload from each of a dozen mines, in a dozen different locations.

GOSS CORPORATION QUARRIES GRANITE FOR ALL PARTS OF COUNTRY

By F. A. Westbrook

THERE are few, if any, operations in the non-metallic mineral industries which are carried on in more picturesque surroundings than those of quarrying granite on the islands along the coast of Maine. There are a good many of these between Wiscasset and Mt. Desert Island, in some places on the mainland and in others on islands but always close to the shore. This, of course, is a great advantage when it comes to making shipments as water transportation can be used almost from the quarry itself.

Crotch Island is well known for its granite and one of the two large companies located here is the John Q. Goss Corporation of Stonington, Me. This company produces rough blocks, known in the trade as "Goss Pink Deer Isle Granite," which are sold to a large number of stone cutters scattered all over the country, especially along the Atlantic seaboard.

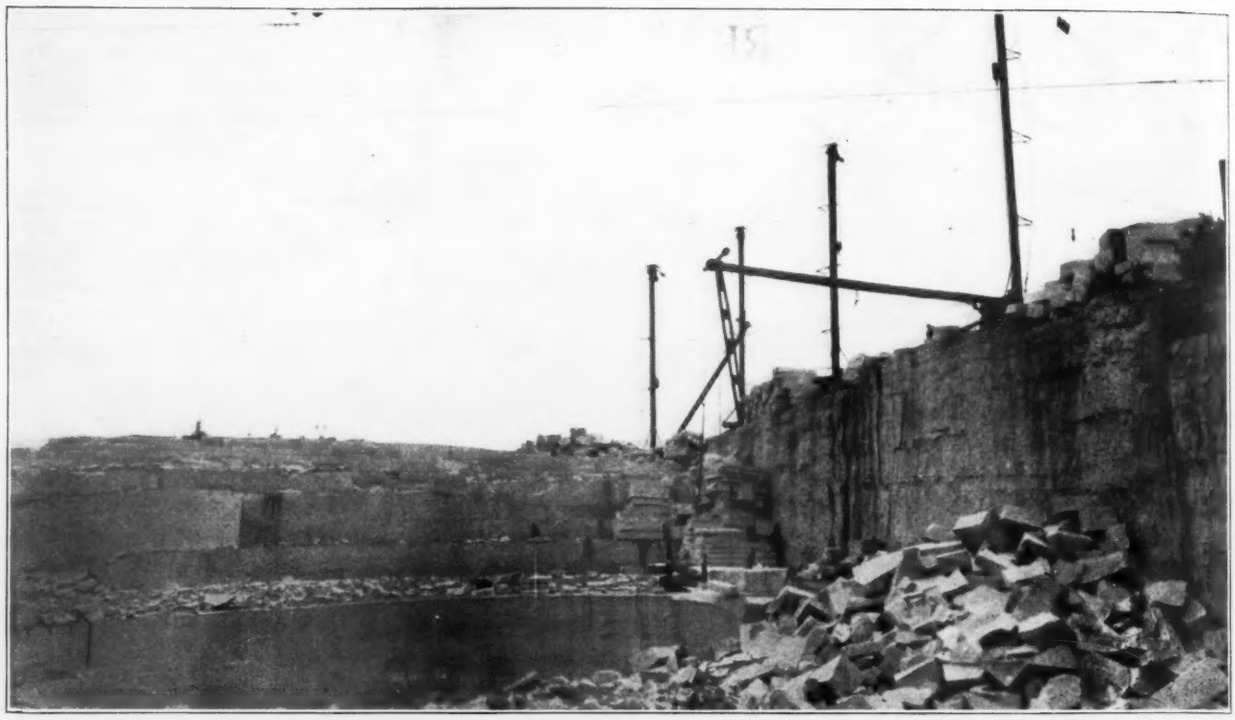
An example of the large scale of the operations carried on here is shown in one of the illustrations. In this instance a seam charge moved out a block about 50 ft. long and weighing about 2000 tons, six inches from its original bed. This gives an opportunity to cut off pieces of any desired size up to the largest practicable for commercial purposes.

There are several quarries in this operation but at the present time only one large one is being worked. This extends practically from the water's edge to the top of the hill and it is from this upper part that stone is now being taken out. Seven derricks are located on this hilltop and the hoisting engines, which are steam-driven Mead-Morrison hoists, have all been placed in one building. The great advantage of this, besides eliminating the upkeep of a number of small houses, is that they can be served from a central boiler plant of Hodge boilers. In the same building but in a separate very well kept room is an Ingersoll-Rand compressor.

A railway with standard gauge tracks on a rather steep incline runs from the hoist house at the top of the quarry down to the dock. It serves a three fold purpose—first, to carry blocks down to the wharf for shipment; second, to carry coal landed from vessels at the dock up to the boiler plant; and finally, to dispose of waste which is taken off on a track turning off from the incline to a point where material may be dumped to lower ground. Cars on this incline are hauled by means of a cable and hoist. It might be added that American Steel and Wire Co. wire rope is used practically throughout.

After the boat has been brought up to the coal dock and moored the coal is taken out in large cylindrical buckets let down into the hold from a

2000 Ton of Goss Pink Deer Isle Granite Moved 6 Inches by Seam Charge

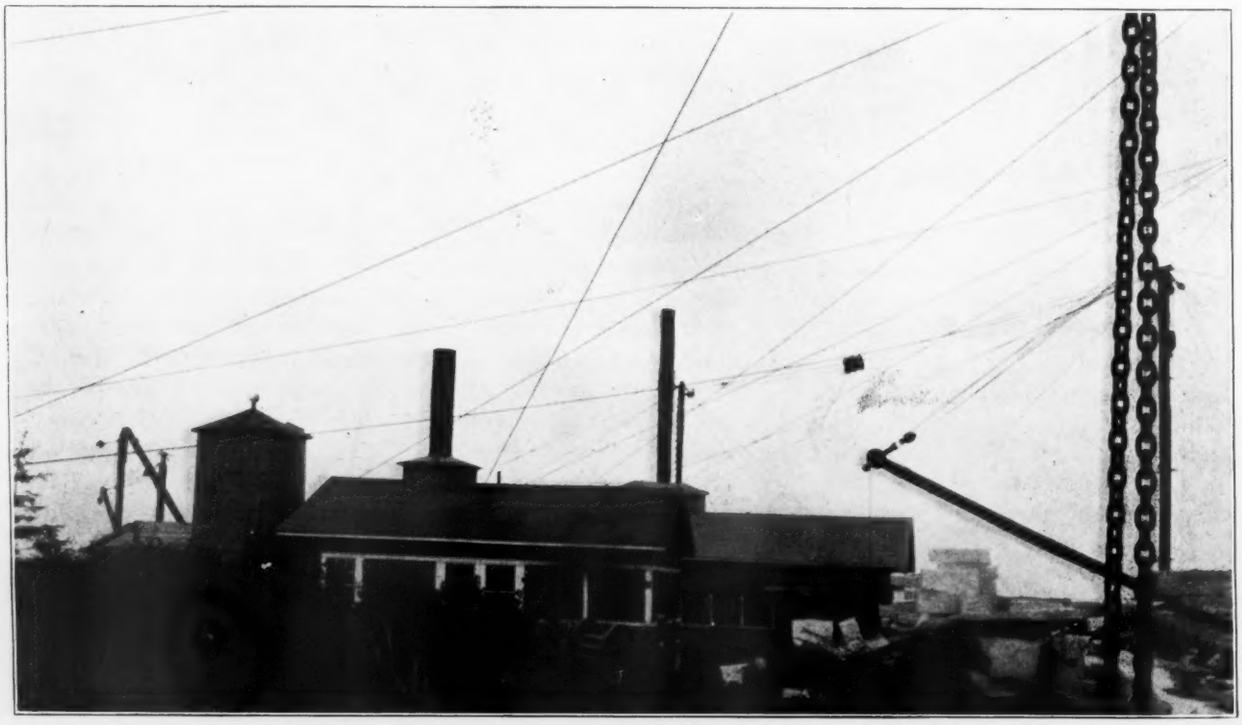


Part of the Face of the Quarry with Derricks on Top

derrick. This also is operated by a Mead-Morrison hoist. The filled bucket is set down on the dock and is again picked up and run along a cableway to a point over the inclined railway where it is lowered on to the car. The latter holds three of these buckets.

In the lower part of the quarry there are three derricks with Lambert and Lidgerwood hoists. A track from the wharf has been run in here also which, with branches, makes it a very simple matter to transport blocks from any part of the quarry to the wharf. These tracks are a continuation of those up the incline to the top of the quarry. At the wharf itself there is a Fairbanks scale for weighing the blocks and a derrick for loading them on to boats as shown in one of the illustrations.

In the lower part of the quarry there is a monument shop which has been rented to an outside party. The equipment in here consists of Kotten surfacing machines, Thomas H. Dallet pneumatic hand tools and a Franklin Moore Co. hoist. Power to run the shop is furnished by a Sears-Roebuck



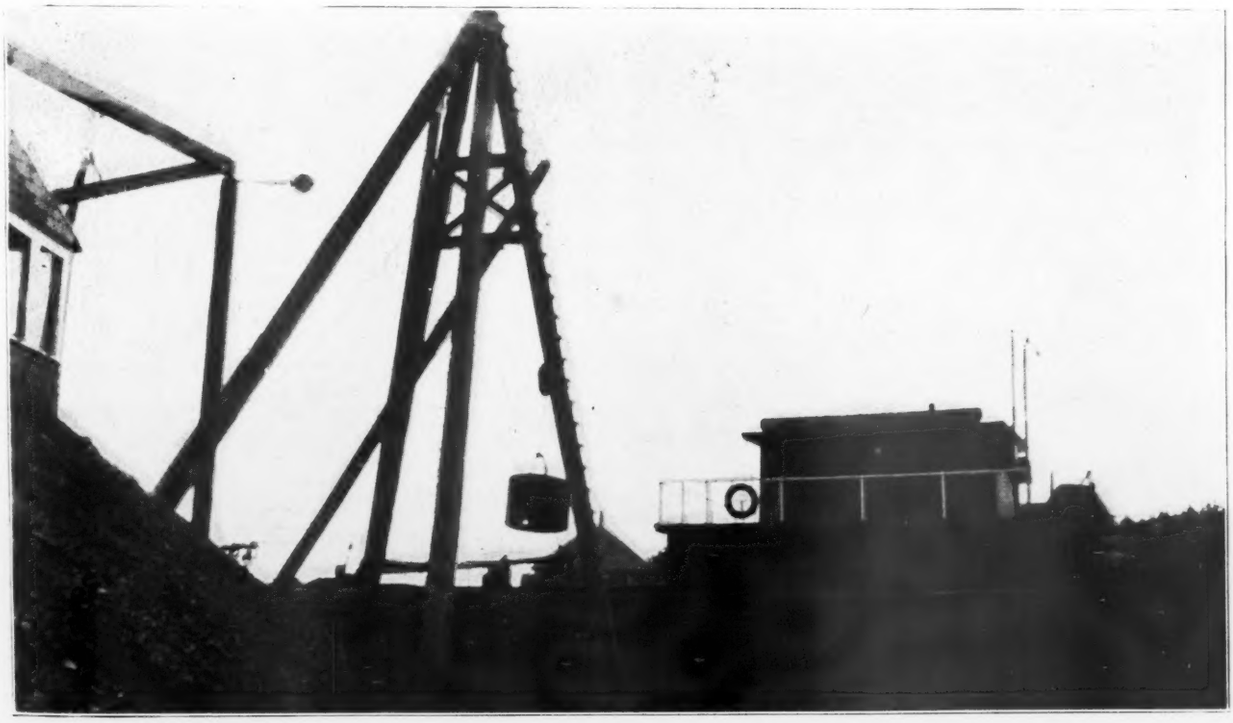
Outside of Hoister House Showing Water Tank

Derricks at Top of Quarry and Coal Being Taken Off in Buckets from Car at Top of Incline

gas engine. This is also belted to a small Clayton compressor to supply air for the tools when the main compressor plant of the quarry is shut down.

Drilling in the quarry is done by Ingersoll-Rand jack hammers and Livingston plug drills and blasting by Du Pont powder. About 70 men are employed the year round.

In addition to the air compresor at the top of the quarry there is another and larger compressor installation at the wharf. Both are connected to the same air line. This second plant consists of one Ingersoll-Sargent and two Chicago Pneumatic machines, individually driven by compound engines. Cooling water for the compressors is pumped by Worthington pumps. Of course central station power on an uninhabited island such as this would only be possible if the mainland were well enough developed industrially to make possible a good sized generating plant with expensive submarine power cable. This not being the case it is necessary for the quarries hereabouts to have their own steam plants and this is why we



Unloading a Coal Barge

Lower Part of Quarry. Penobscot Bay in Background

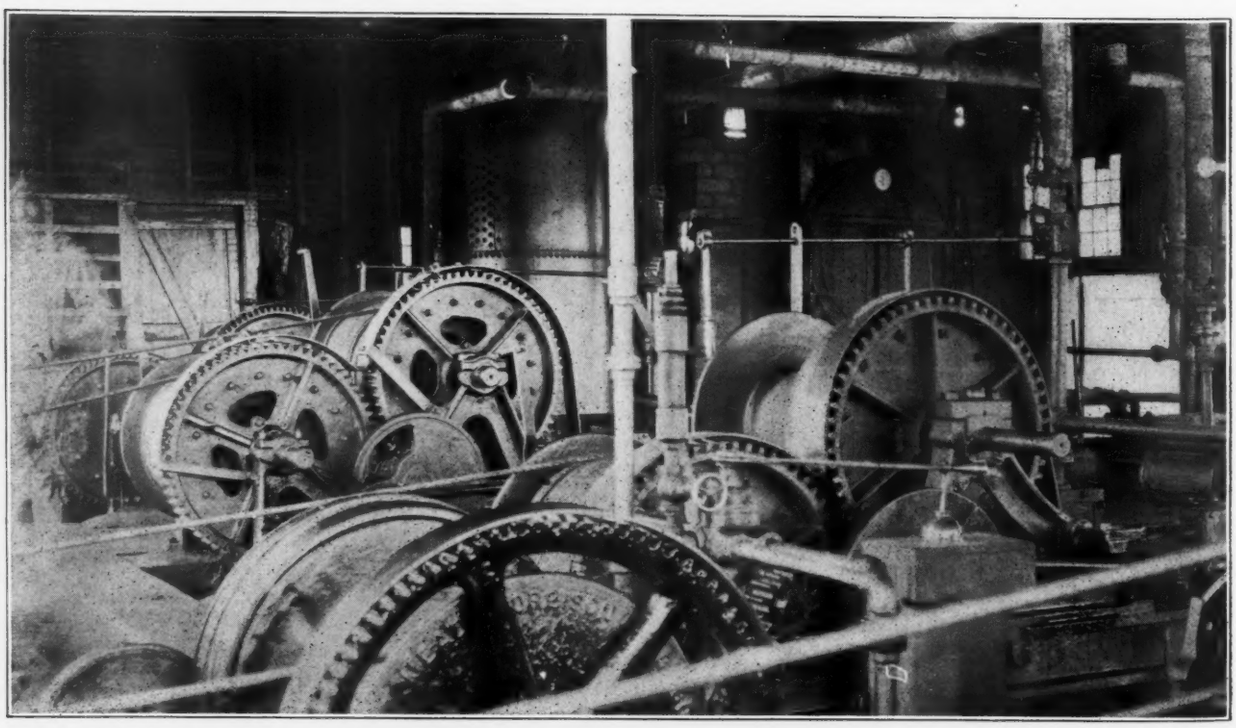
find the compressors, hoists and other machinery driven by steam engines. Steam is suplied here by Hodge fire tube boilers. There is one steam driven electrical power generator made by the New England Motor Co. of 110 volt, 70 ampere capacity which is used for lighting. Otherwise electrical power is conspicuous by its absence.

Another result of the isolated situation of the plant is that it has a very complete machine shop and blacksmith shop where practically all repairs are made.

The machine shop is driven by a Bath Iron Works vertical engine. The completeness of the shop will be appreciated from the following list of machines installed there: Aurora Tool Works drill press; Niles Tool Works lathe, F. E. Reed lathe, small Flather lathe, Atkins power sow, Cincinnati Shaper Co. shaper, Putnam Machine Co. planer, Dressis Machine Tool Co. radial drill, Two Blount double grinder, Oesterlein universal grinder.

In the lower blacksmith shop there is a Niles, Bement, Pond trip hammer and in the upper shop one large and one small Ingersoll-Rand drill sharpener, a trip hammer and a Champion forge blower for use when the compressor plants are shut down.

An important detail which cannot fail to impress a visitor is the neatness and cleanliness of all the buildings and shops. For instance, the compressor rooms are so clean that no one would think of dropping a match on the floor.



Part of the Hoist Room Sho wing Boilers in the Rear

COLD WEATHER LUBRICATION

LUBRICATION in cold weather is a problem requiring special attention. The October issue of Lubrication published by the Texas Company contains an article on cold weather and low temperature lubrication from which this article has been taken. The advent of cold weather every year brings about a certain amount of difficulty in the lubrication of machinery more or less exposed to atmospheric temperatures and weather conditions. To effectively counteract these latter is, in fact, one of the outstanding problems in cold weather maintenance of equipment in the handling of bulk materials in the rock products industry.

It is more or less impracticable to solve this problem or, in other words, to attain the ideal in effective lubrication. Lubricating oils and greases simply will not function as they should at subnormal temperatures of operation due to physical limitations. The outstanding of these latter is the tendency towards sluggish flow and ultimate congealment.

All lubricants, however, will not behave in the same manner. It will depend entirely upon their base and the extent of their paraffine wax content. Essentially it is this latter which causes sluggish flow and ultimate congealment, to render an oil incapable of flowing to the wearing surfaces, whether this oil be delivered as such, or as the lubricating component of a grease.

In general, lubricating oils refined from naphthenic base crudes in which the paraffine wax content is low or even negligible in many instances, will show a considerably lower pour test or temperature of congealment than those refined from paraffine base crudes, unless the latter are suitably chilled and otherwise treated for wax removal in the course of refinement.

In the production of rock productions and problem of cold weather lubrication may frequently become aggravating, especially in view of the fact that much of the machinery involved is so rugged as to deceive the operators in regard to the actual amount of wear which may occur if friction is not effectively reduced. The handling of such products is at best a difficult job and one conducive to a good deal of wear and tear. The crusher, breaker or screen will frequently be subjected to quite as intensive service as the crane, power shovel or other digging machine in cold weather.

The tripple is rarely heated, though it is usually under adequate cover. In the stone quarry or gravel pit, on the other hand, even covering may be an absent luxury. And yet fine stone or building sand must be produced, almost regardless of the weather or temperature. So gear teeth and bearings may very easily present a problem in lubrication. Very often the former are not even guarded.

Jaw Crushers and Breakers

To enable the clearest understanding of the several factors which should be considered in cold weather lubrication, it will be well to discuss the equipment involved in an individual manner.

Lubrication is essentially confined to the bearings of the pitman and eccentric shaft. The former carry the pitman or heavy steel casting which oscillates with its bearing as the point of suspension, to bring about the requisite degree of crushing. As a rule the pitman bearing is water cooled; in addition, in certain larger crushers it is relieved of much of the weight by the use of links and coiled springs, for the potential friction involved is considerable.

As a result, lubrication of the pitman bearing is of decided importance. Grease is usually the most generally adaptable lubricant, being applied to the bearing either by means of pressure lubricators or via reservoirs equipped with wool waste or some other form of pad retainer to insure positive lubrication without undue loss.

Where pressure lubrication is employed a light solid grease will usually be most adaptable. The use of wool waste or pad lubrication, however, will require a thinner grease, relatively fluid in consistency, in order to enable proper penetration of the wool. In both instances the lubricant must be capable of reaching the lower wearing surfaces where pressures and friction will be the greatest irrespective of the operating temperature. To more safely insure this certain builders provide for delivery of grease (under pressure) to both the top and bottom of the bearings.

Eccentric bearings likewise require positive lubrication with a suitable grade of grease. Unless the weight of the pitman is more or less balanced by springs, etc., its weight will be exerted upon the eccentric shaft bearings, with the probably result that the lubricant will be unable to penetrate and maintain the requisite friction-reducing film between the shaft and bearings.

The construction of the crusher must therefore always be taken into consideration; where springs and links are used to balance the pitman, reservoir pad lubrication using a medium fluid, low pour test grease will probably work out satisfactorily. Where the weight of the pitman is exerted on the eccentric bearings, as well as on its own supports, pressure lubrication with a heavier grease will be more positive.

Gyratory Crushers

In the modern gyratory the matter of eccentric, gear, counter shaft and anti-friction bearing lubrication are most important. Automatic lubrication whereby the oil is circulated under pressure throughout the lower mechanisms is becoming practically standard on all such equipment due to the absolute necessity for continued and dependable maintenance of a sufficient flow of oil to withstand the pressure involved.

This is brought about by means of a suitable oil pump which is located at the bottom of the crusher either within or adjacent to the oil reservoir or chamber in the bottom plate. An ample supply of oil is contained in the system, which as a rule includes a suitable filter or strainer through which the oil passes at each circulation. This, together with the general dustproof construction of the modern gyratory insures against the entry and circulation of an excess of dust through the system. As a result, all the lower wearing parts are served with a flood of clean oil throughout the period of operation of the gyratory crusher, for by virtue of the nature of the design and construction the oil pump starts simultaneously with the latter, operating at a speed commensurate with the rate of crushing.

In cold weather it will always be advisable to resort to an oil of comparatively low viscosity, especially if there is no provision (in the form of heating coils) in the system for heating the oil prior to starting, or during operation. Usually a viscosity of from 500 to 750 seconds Saybolt at 100 degrees Fahr. will be best, according to the necessity for lower pour test and greater fluidity, especially on starting.

The top bearings, suspension and wearing rings within the dust or spider cap at the top of the main shaft of the average gyratory crusher will also require considerable care in lubrication. Essentially a product must be chosen which will not run prematurely through the bearings, at higher temperatures, to perhaps leave their surfaces susceptible to excessive friction and wear, and yet it must not become too heavy in cold weather. As a general rule crusher oil will be best for this purpose provided that it has a sufficiently low pour test.

To facilitate the retention of the oil, the space within the cap can be packed with a pad of wool waste saturated in the lubricant. This should last for several weeks, provided that a small quantity of fresh oil is added every day or two via the oil hole in the cap.

Ball, Tube and Rod Mills, Etc.

The above equipment, where carried by horizontal shafts, will frequently be difficult to lubricate, because of the great weight carried by the bearings and the fine dust which will always find its way into the clearance spaces. Every possible precaution is taken to keep this dust out of the bearings, but it is practically impossible to attain this ideal, with the result that foreign matter of this nature is frequently the cause of their rapid destruction.

The main shaft bearings are relatively large so that the unit loads are not excessive, but in spite of this it is necessary to use a lubricant possessing considerable body even in cold weather in order to prevent undue frictional heat. Fortunately, such mills revolve comparatively slowly and there is no objection to a heavy lubricant from the viewpoint of speed. As a rules, a grease of medium consistency will be the most suitable lubricant for these bearings, provided its oil content will insure adequate fluidity.

Because of the speed at which it revolves, the pinion shaft on such mills is frequently carried in ring-oiled bearings. The most suitable lubricant for these in cold weather is an engine or machine oil of about 200 seconds Saybolt viscosity at 100 Fahr.

For the gears of such mills the most satisfactory lubricant will usually be one with adequate body or viscosity to prevent metallic contact under heavy loads, and resist the drying action of dust. As a rule a straight mineral lubricant of approximately 1,000 seconds Saybolt viscosity at 210 degrees Fahr. will best serve this purpose, unless temperatures fall too far, when it may be advisable to drop the viscosity to perhaps 200 seconds Saybolt.

Crushing Rolls

On such equipment gearing will be the essential parts which may involve difficulty from a lubrication point of view in cold weather. Such parts by virtue of their usually exposed nature will function best if treated at periodic intervals with a fairly heavy-bodied gear lubricant. This must not be too heavy nor applied in excess, otherwise there will be a tendency of dust being accumulated, the resultant paste or scale of dust-impregnated lubricant being thrown off during the subsequent operation.

Rotary Type Screens

The mechanism at the driving end of the average rotary screen involves the most difficulty from a lubricating point of view, especially in regard to the gears. These latter will, as a rule, operate exposed with their lubricants subjected to contamination by dust, dirt and probably moisture.

These conditions would, of course, also affect the bearings to a certain extent, although the housings, if properly designed and installed, would prevent at least the entry of an excessive amount of dust and dirt or water. As a rule these are plain

(*Continued on page 92*)

SAFETY PROPAGANDA

A. O. Deringer

THERE is an age old adage that says, "Strike while the iron is hot," was never more true than now. We have all come to the realization of how futile it is to strike cold iron to shape it to our wants and needs. We find it requires a lot of energy and nothing accomplished.

We have all read with much interest, the proceedings of the recently held National Safety Council and the remarks by men high in the industrial realm of the Nation. It is indeed gratifying to note the interest, time and expense industries are devoting to make their business places better and more safe for their employees.

If we who have passed through the past two score years of industrial employment, compare present day methods with those of the day when we first ventured out into the industrial field, we cannot help but see the vast difference in methods of operation, especially as they pertain toward the welfare of the employee. While there still are countless numbers of improvements that ought and must be carried out to afford the employee more and better protection, and to protect the employers interest as well, still conditions are gradually being improved, but not at the rate we want to see them improve, nor to keep pace with the increased industrial development.

Going back to the meeting of the Safety Council, I dare say that every one in attendance was very enthusiastic, and had formulated plans in his mind of how he was going to have a 100 per cent accidentless plant. 'Tis just so with those of us who did not attend, but read the doings of the meetings. We also grew very enthusiastic as we read the accounts and visualized ourselves as being great humanitarians, but when we get out on the job next day and see some part of a building out of repair we tell Joe Smith to go and make the necessary repairs without giving any thought to hazards he will be subjected to in making the repairs. We are at that time concerned only in having the repairs made. We also promised ourselves to have a committee appointed from among our employes to discuss and formulate safety plans for our plant.

But before we have progressed very far the fever gradually dies out and when out among the men on the job we become irritable when we find a man consuming more time than he ought to because of playing safe. We feel he is carrying his playing safe a little too far and that he ought to take a few chances in order to rush the job, and make it less expensive. It is then and there that we forget all about our safety resolutions and drift along in the same old rut without doing anything to make our plant a better and a safer place to work in.

Until we get over the notion of always and eternally chasing after the almighty dollar and to a great degree get the same notion out of the minds of our employees, we are bound to have more than our share of industrial accidents, which work to our detriment both commercially and economically. Not by any means is the employer to blame for all industrial accidents, only in so far as he neglects to provide proper safeguards, and to get the safety idea across to the employee. It requires a good consciencious safety committe and a stern well meaning executive to enforce safety rules among employees.

The employee often times more so than the employer is inclined and willing to take a short cut in order to complete his job and have some time to himself. I have known men to deliberately violate certain safety rules in order to rush their job or because in conforming to certain safety rules the job became a little more irksome. They would rather jeopardize their health and life than resort to the imposed safeguards and precautions.

We often see a marked difference in employees coming from different employments. Those coming from establishments where the safety rules were constantly impressed upon and adhered to by the employe, had a neater appearance and were cautions in their work. Even their manner of drinking water on an extremely hot day was noticeable, whereas those who came from employment where safety rules and methods were not even given scondary consideration, were often slovenly in their appearance and in everything they did. In fact, their general apeparance and demeanor was that of a careless and reckless employee.

It should be imperative in all industries that safety ideas and the exercise of them be drilled into the minds of the employees and the employer as well. It should become imperative that children in school, along with their hygienic education be taught the simple rudiments of safety. They are now taught how to care for their teeth, how and what to eat, how and where to sleep, to breathe and to walk, in fact, the entire health curriculum of our schools is a great health and life saver. But why not impress upon them early, the necessity of avoiding carelessness and recklessness and train them to be alert and watchful not of themselves along but of those with whom they come in contact, and thus spare themselves and others a lot of grief and agony.

If it became imperative to teach safety in our schools the present generation could not hope to gain or profit by it except as the propaganda of the children influenced the parents and those industrial workers with whom they came in contact. Hu-

(*Continued on page 92*)

EXPOSITION OF CHEMICAL INDUSTRIES

ONE of the most remarkable achievements in the history of industry has just been completed with the close of the Eleventh Exposition of Chemical Industries at the Grand Central Palace in New York City where probably the greatest collection of the various chemical and allied industries in the history of the Exposition were assembled. The Udylite Company exhibit of cadimum plating showed a metal resistant to sulphur fumes. The Matheson Company exhibited ethylene and other liquidfied gases and the distinctive feature of their exhibit was the demonstration of ethylene gas in hastening of ripened fruit colors on fruit. The American British Chemical Supplies Company showed a new plastic material produced from acetyl cellulose. And, for the first time, a large number of displays of fatty acids, waxes, glycerol and products made therefrom were shown.

Many new and outstanding developments in various by-products were exhibited. One of the most comprehensive displays of this nature was by the Ford Motor Company By-Products Division. The model of the wood distillation plant created much favorable comment because of the detail in which it was constructed and the number of by-products produced, and the series of wood distillation products displayed by the Cleveland Cliffs Iron Company. The Commercial Solvents Company exhibited synthetic methanol which has heretofore been a product essentially obtained from wood distillation which they have succeeded in making synthetically and this was considered one of the outstanding synthetic materials developed in this country. Among new machinery exhibits were a cantilever filter by the United Filter Company and an interior filter shown for the first time by the Dorr Company, both of which are of great importance in the filtration field. The drying machinery opened up some very new developments, among which were the exhibits by the Gordon Davis Engineering Company and James Hunter Machine Company.

The strides taken in the development of machinery used in handling metaliferous ores is one that has taken long strides. Among the crushers were the Hardinge Company's conical ball mill, and a type of red mill which are adapted to an enormous range of uses in general industry. The Abbe Engineering Company who for years have been among the leaders in the ball mill grinding field had a fine exhibit. The Bethlehem Steel Company's pulverizer which dates far back of any metallurgical operation in Chile and is a revival of the Chilean mill and its principal features are the revival of the skilled workmanship of the rolls and the methods of handling the raw materials. The various screening processes by the W. S. Tyler Company, Niagara Concrete Mixer Company, Norwood Engineering Company, Orville Simpson Company, C. W. Hunt and Company, and the Traylor Vibrator Company created much favorable comment and are of great importance in the pit and quarry chemical and mining industries. The exhibit of the Western Precipitation Company, of the Cottrell system of air cleaning by electrical precipitation was one of the greatest of its kind. In the Container Section, the Pressed Steel Tank Company exhibited for the first time a Monel metal tank used for the transportation of nitric acid. This was considered one of the most interesting and useful exhibits in the Show. The Wheeling Corrugated Steel Company's new corrugated drum and barrel which they manufactured on the premises secured very favorable consideration from representatives of the industry. The Carpenter Container Company with its new fabricated barrel and drum obtained many interested visitors during the week.

The new Vorce cell shown by the Electro Chemical Engineering and Supply Company which is an entirely new process for making chlorine soda was one of the greatest features of the Exposition and was shown for the first time creating a great deal of favorable comment by engineering authorities and visitors. Among the oldest manufacturers of silver salts in the United States who exhibited for the first time was Phillips & Jacobs, along with the Standard Calorimeter Company showing Parr calorimeters. Bausch & Lomb Optical Company showed a number of new optical instruments for the first time, developing a great deal of interest among the visitors to the chemical industry general Electric Company's hydrogen welding process using an electric spark as the heating element for hydrogen welding received much favorable comment by the visitors. Another exhibit of great interest was that of vitaglass which transmits actinic or ultra violet ray which is life and health giving, and is a development of the chemical industry. Miner Laboratories display of Furfural and its derivatives and by-products with a new development for electrolytic engraving was of equal importance to the visitors.

Various exhibits in the Southern Section by the Southern Railway Company, The Alabama, Birmingham and Coast Railway, and the Southern Pacific Lines contained exhibits of raw materials useful in the chemical industries throughout the country. The Canadian Section and the Ontario Department of Mines covered a wide range of products and raw materials that were decidedly interesting and well displayed. The various metals and their treatments were among the prominent fea-

(*Continued on page 92*)

UNIQUE METHODS PRODUCE UNUSUAL ROCK

By E. D. Roberts

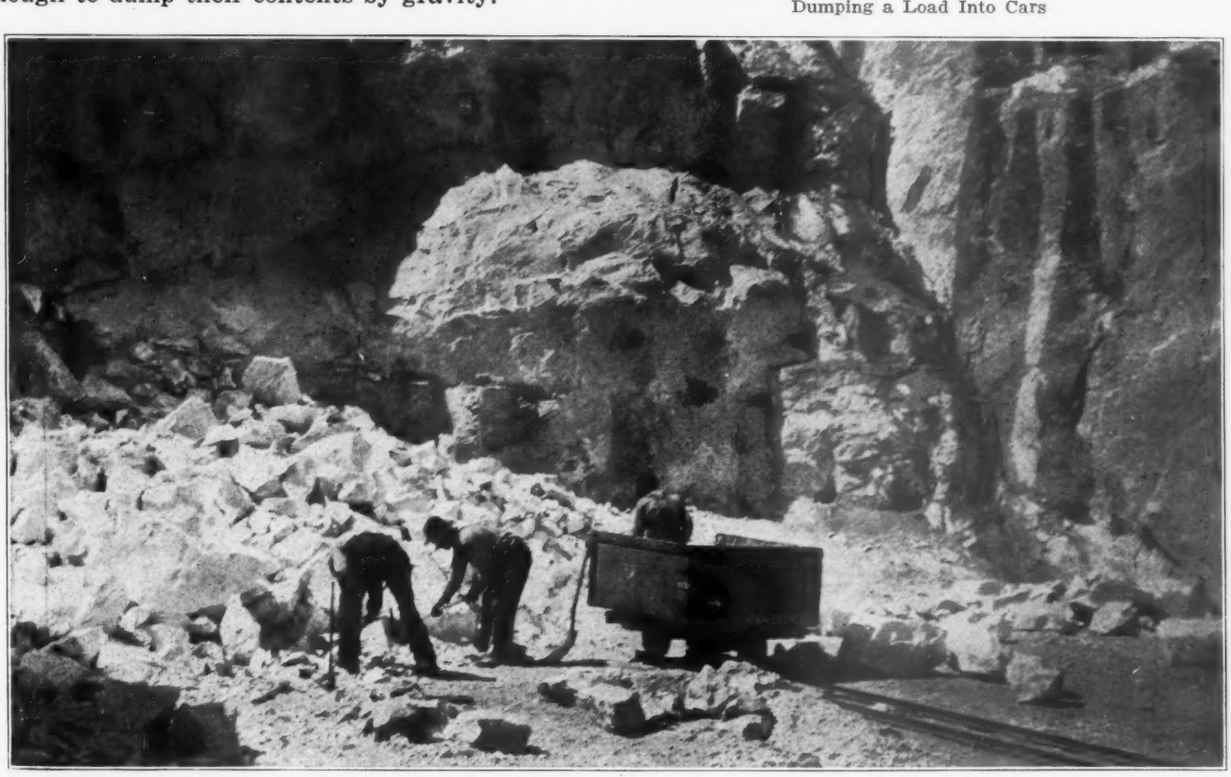
AT FELSCH, Michigan, the Metro Nite Company has an almost inexhaustible supply of the only known deposit of white crystalline calcium carbonate, magnesium and calcium magnesium silicate. It is called "Tri-Mineral Rock" because of its three mineral constitutents which are essential for use as an extender in the manufacture of paints. The rock has found great favor with paint manufacturers due to its capacity for bulking and the small amount of oil required to produce a high quality paint.

The chemical analysis of this rock is as follows:

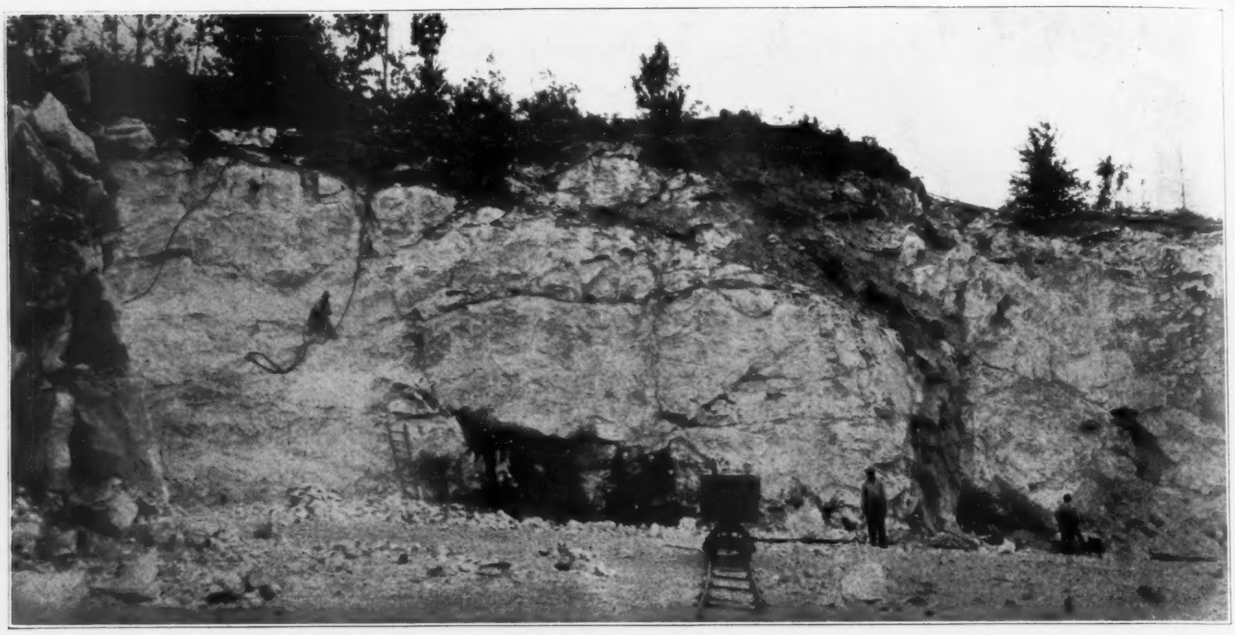
	Per cent
Calcium Carbonate—$CaCO_3$	44.62
Calcium magnesium silicate—$Ca_2Mg_2SiO_2$	19.58
Magnesium carbonate—$MgCO_3$	35.65
Moisture—H_2O	00.15

The rock is drilled, shot and reduced to one man size, after which it is loaded into skips placed on a small flat car, as shown in the illustration. These narrow gauge cars are then moved to position under a stiff leg derrick which picks up the loaded skip and raises it to the elevation of the surface tracks. Here the rock is dumped into steel side dump cars which transport it to the railroad cars. In locating the surface tracks, enough elevation was provided so that the cars enter the box cars high enough to dump their contents by gravity.

Dumping a Load Into Cars



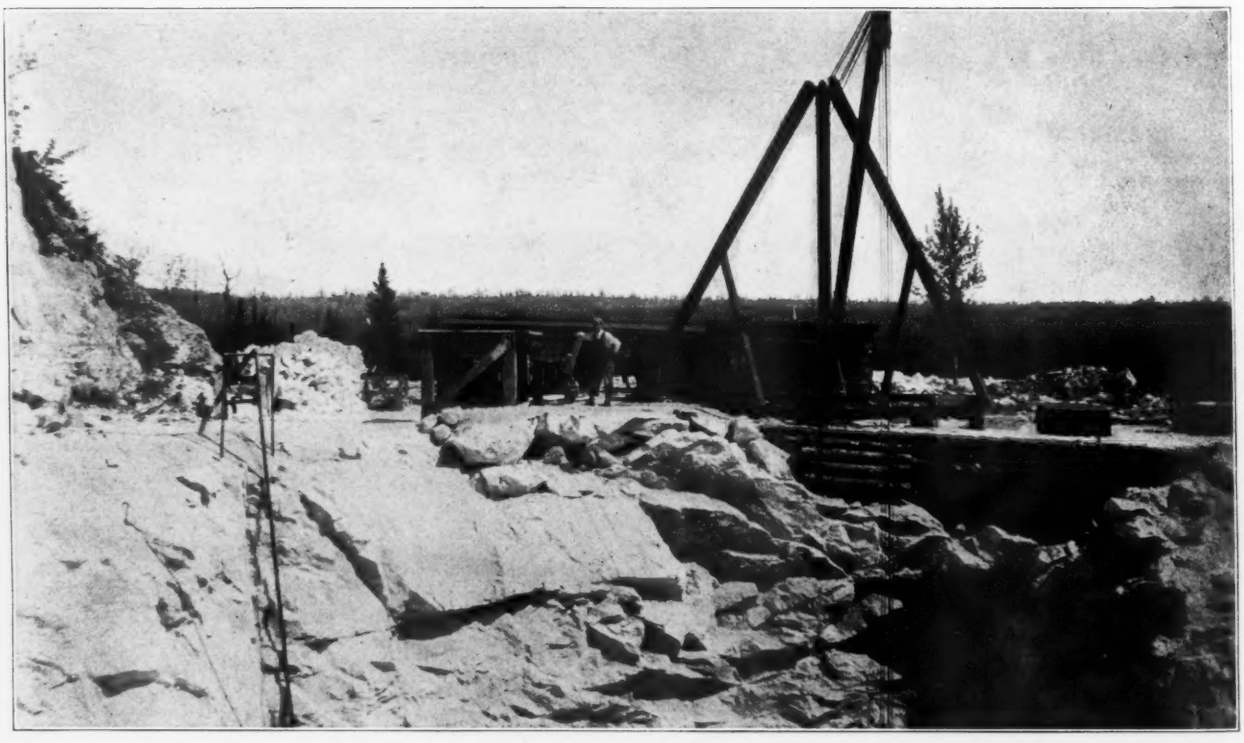
Quarry View Showing Skip Loading



Another View in Quarry

The crushing plant of the Metro Nite Company is located at Milwaukee, Wisconsin, where new handling equipment and a new storage bin of 3,000 tons capacity have been recently installed. The product from the mines at Felsch, Michigan, is shipped in sealed box cars to the Milwaukee plant. Arriving at Milwaukee, the cars are spotted opposite the receiving door. The dolomite stone is then loaded into wheelbarrows and wheeled to the initial crusher, located within the new building.

This crusher, a 13 inch by 30 inch Farrel Type B jaw crusher, reduces the crystalline rock to a two inch maximum and discharges it into a 16 inch inclined bucket elevator, which carries the rock to the top of the storage bins where it is discharged into a wooden feed box. One side of this box is open, allowing the rock to feed onto a 16 inch distributing belt placed underneath the box and leading away from the open side. Spilling is prevented by two sideboards made of steel to which rubber flaps are attached that ride on the belt. The steel sideboards are fastened to the frame by two bolts each, the bolt nearest to the box serving as a center about which the guide may be rotated, which is necessary



Stiff Leg Derrick for Moving Narrow Gauge Cars

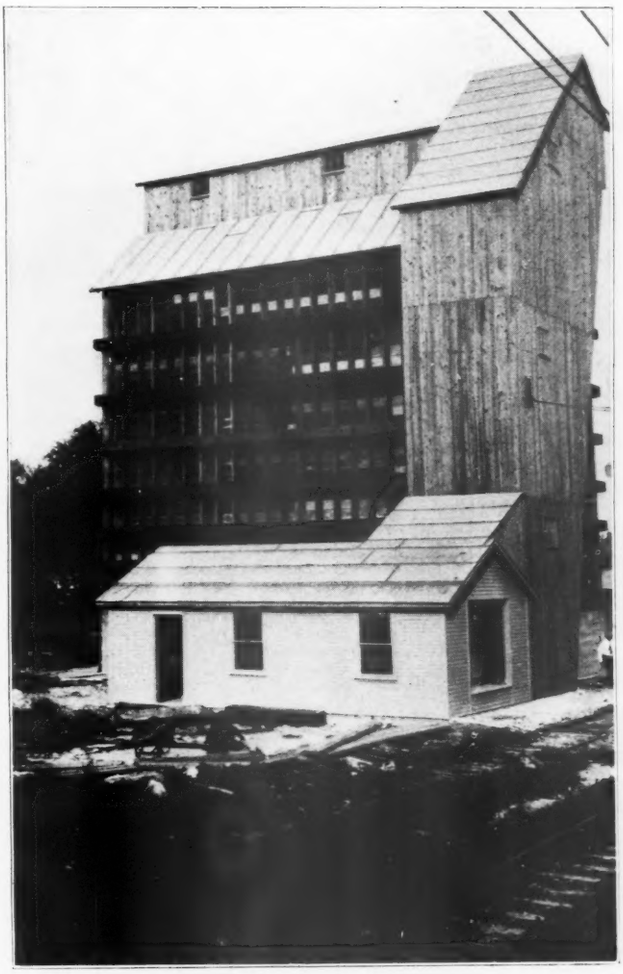
when the tripper is spotted close to the feed box, the other bolt, operating in a curved slot, serving to anchor the guide in the position desired.

Troughing rolls, manufactured by the Lippman Manufacturing Co., support the distributing belt throughout the 55 feet of its travel along the top of the storage bin. Seven pairs of openings have been provided in the storage bin covering so that the traveling tripper may discharge the rock from the belt into the bin at short intervals, thereby providing for a greater bin capacity.

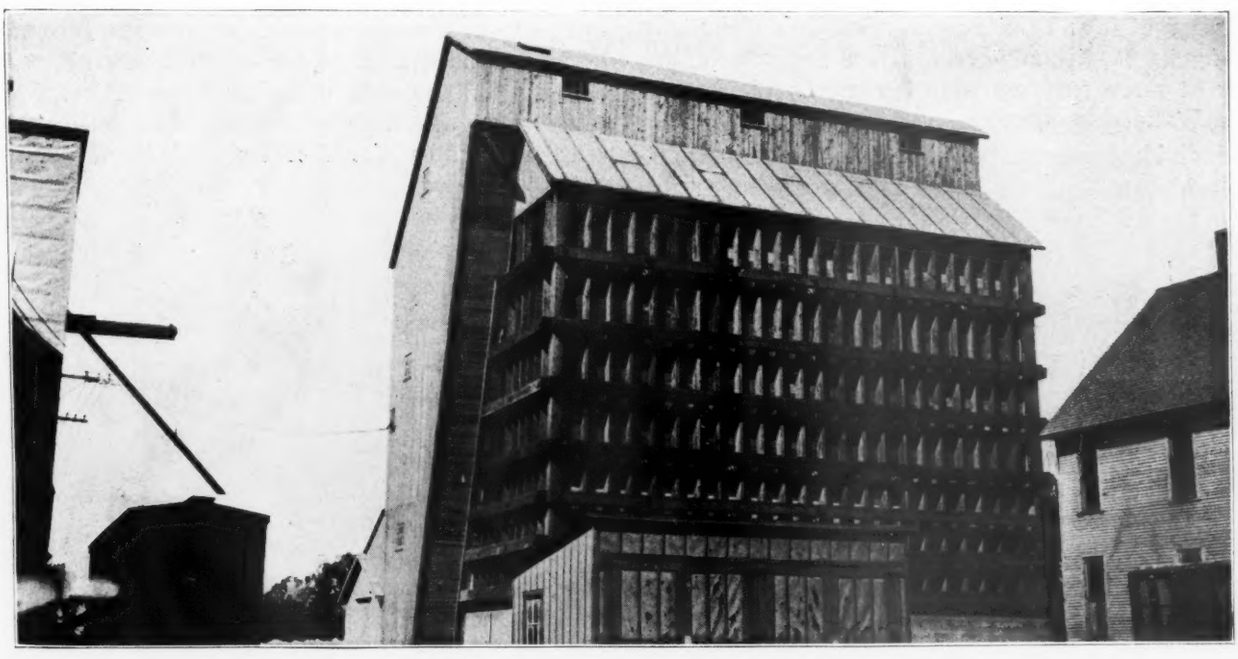
The bin, itself, holding 3,000 tons of rock, is made of wood, resting on concrete foundation walls, with a hoppered bottom provided by a sloped fill covered with a concrete apron. Four inch by twelve inch planks are used as siding for the bin with 12 inch by 12 inch timbers at intervals around the outsides acting as wallers through which the tie rods pass.

Underneath the bin is a 6 foot by 6 foot concrete tunnel. This tunnel extends underneath the tracks and over in to the finishing plant. The rock is drawn from the bin through openings in the roof of the tunnel by opening the ball bearing gates fitted to the openings. A novel feature of these Lippman slide gates is the fact that they operate easier under load than when the bin is empty. A traveling Lippman feeder with an eccentric connection between the motor and the sliding plate controls the rate at which rock may be drawn from the bin to the reclamation belt. Five inch channels fastened to the roof of the tunnel furnish the support for this electrically operated feeder which has six adjustments giving a feed of 5, 10, 15, 20, 25, and 30 tons per hour.

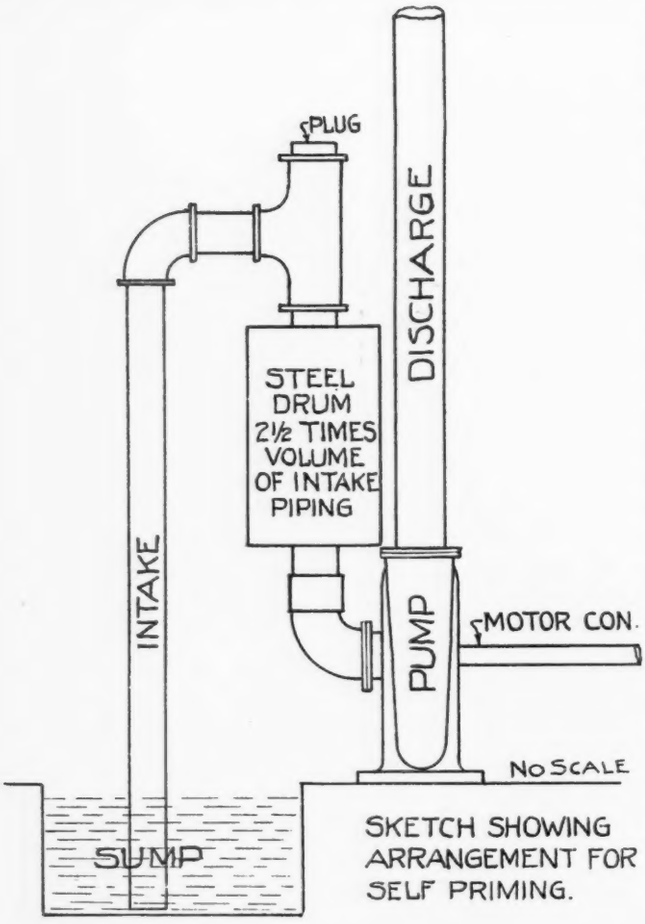
As the reclamation belt nears the discharge end, it is inclined upwards to pass undearneath the old storage bin at the proper height to enable rock stored in this old bin to feed on the belt. The belt discharges into the Number 2 Telsmith reduction



New Plant Unit



Grinding Plant with New Unit in Front



crusher which reduces the material to ½ inch maximum, as the first stage of the finish grind process.

The traveling tripper, capable of spouting to the left or right or both ways at once and constructed on a structural steel frame, requires about two feet of head room and does not require a large head house for its operation. The non-stickable gates under the bin and the traveling feeder do away with the grief that usually goes with a job in a tunnel. All of these features were designed and built by Mr. Walter Lippman.

Individual electric drives have been provided throughout the new unit. A 50 horsepower Allis-Chalmers motor drives the large Farrel jaw crusher and a 10 horsepower motor of the same make operates the bucket elevator. The distributing conveyor is equipped with a 5 horsepower motor with a 7½ horsepower motor on the reclamation belt and a three horsepower Louis Allis motor is mounted on the traveling feeder which draws the rock from the bin.

A Fairbanks Morse centrifugal pump, operating at 1800 r.p.m. through a direct connection to its motor drive, is used to keep the water out of the tunnel. This water is led to a sump in which the pumps suction pipe has been placed. No foot valve is provided, as the flow of water is not sufficient to keep the pump operating continuously, the pump starting and stopping through an automatic float control. A self primer, designed by Mr. Lippman, consisting of a drum placed in the suction line just above the pump intake is installed here. The intake pipe is led up above the pump and into the drum which holds 2½ times the volume furnished by the pipe section from the drum to the sump. When the pump starts, it first draws upon the water in the drum which in dropping causes the water to rise in the intake pipe. This new water will enter the drum before the pipe has emptied it which ensures continuous priming of the pump.

As the stone starts through the finish mill it passes through the Number 2 Telsmith reduction crusher, previously mentioned. Before the installation of the new feed belt from the new large capacity storage bins, this rock was fed to the reduction crusher by a short belt operating underneath the old bins, which were filled by a short vertical bucket elevator which received the discharge from the old 12 by 22 primary crusher through which the rock passed as it was unloaded from the cars. This old crusher, the elevator and the old storage bins will be kept in position for use in case of emergency or necessary shut downs in the new receiving end.

A vertical bucket elevator operation on 50 foot centers elevates the discharge of the Telsmith

Plant of the Metro Nite Company

crusher on to a hexagon screen. This screen takes out the larger material for regrinding in a 30 by 14, Style A, Allis-Chalmers roll crusher, while the fines are deposited in a 15 ton bin from which it is drawn by a 10 inch screw conveyor and carried to the feed bins located over two Bonnett tube mills. The reground material is discharged from the crushing rolls into the bucket elevator which serves the Number 2 Telsmith and is screened with the raw rock from it.

In case pebbles for stucco work or (what is now gaining in importance) ⅛ inch gravel for art stone work are desired, the proper screens are placed in the hexagon screen to deliver these grades of material, which are caught in separate storage bins and stored until drawn out at the bottom for shipment.

The two 4 foot by 22 foot Bonnett tube mills reduce the fine material to a powder by the use of Belgian blocks lining and Belgian pebbles, another measure taken to insure a clear white product. A bucket elevator is located at the discharge end of each tube mill for elevation of the fine material to the air separators with a third placed between the two mills to serve as a standby in case either or both of the other two elevators are shut down.

There are 4 air separators, two Raymond and two of their own make. The separation is made in two stages by means of cyclone collectors, the fine grade being barrelled or sacked for shipment while the coarser material is again passed through the tube mills for a further reduction. That air which has passed through the collectors is now passed through a multitude of finely woven bags which extract all dust. A Number 2 Sturtevant exhauster fan draws the air from each machine by means of convenient outlets and passes it through another set of bags. Due to these dust collecting installations of which there are three there is absolutely no dust in the plant. This is remarkable when it is realized that the product is many times finer than Portland cement. Furthermore, this collection of the finest of the "flour" pays for itself and a better product and a greater quantity produced.

Mr. J. V. Rohan of Racine, Wisconsin, is president of The Metro-Nite Company and Mr. Herbert F. Johnson, also of Racine, is vice-president of the company. Mr. Edward Copps, who maintains the office of the company at 333 Hartford Ave., Milwaukee, Wisconsin, is secretary, treasurer and general manager.

Three factors prompted Mr. Edward Copps to make the expenditure required for this added installation. These were economy of operation, continuous supply of stone, and protecting the rock from possible discoloration while stored in piles awaiting reduction.

This desire to protect the raw rock from discoloration is one of the remarkable things found at this plant, which no doubt has helped to make their principal product, Metro-Nite the whitest inert pigment on earth. This aim is almost a fetich with Mr. Copps.

The new unit was designed and built by Mr. Walter Lippman who has acted as Mr. Copps engineer for some time. Profiting by his many years experience in the design, construction, and operation of material handling plants, Mr. Lippman has brought out several newly improved machines which he built in his own manufacturing plant and installed in the Metro-Nite plant, thereby greatly increasing its efficiency and ease of operation.

Highways in Nicaragua

As no accurate survey of all Nicaragua has ever been made, the actual extent of its roads is not definitely known. The figures given below are as nearly correct as can be obtained, being based on statements made by the Financial High Commissioner, under whose supervision road improvement is being carried out, and of the American engineering in charge of construction. Of the total 1,100 miles thus reckoned, 500 miles are classed as main roads, connecting cities or towns of importance, and the remaining 600 miles are branch roads.

The greater part of the total consist of mere cart tracks, practicable only for oxcarts, and sections of these roads are not even thus passable during the rainy season. Only 85 miles are classed as third-class roads; that is, dirt roads which have been graded and surfaced with earth. This portion, together with a few miles of the four-class or unimproved roads, may be traversed by automobiles the year round.

The total amount expended on roads in 1926 was $117,537, of which $12,300 was spent in repairs on previously constructed sections of third-class road, and $105,237 was spent in grading and surfacing cart roads, improving them to a point where they might be considered as third class.

South Africa Buys American Crushers

The import of stone crushers into South Africa from the United States has been gradualy increasing during the past three years and, where formerly British manufacturers dominated this trade, American machines are now seen increasing numbers. American participation has increased from a value of £1,650, or only 2.7 per cent, in 1923, when separate statistics were first made available, to £10,290, or 21.5 per cent, during 1926. The British share of this business, although still dominant, has declined from £59,209, or 97 per cent to £36,315, or 76 per cent.

Imports in 1924 were valued at £60,882, Great Britain supplying £59,209 and the United States £1,650. In 1925, of a total of £32,824, Great Britain supplied £29,757 and the United States £3,041. To the 1926 total of £47,789, Great Britain contributed £36,375 and the United States £10,290.

(*Continued from page 84*)

babbitted bearings with provision for grease lubrication.

Under the prevalent operating conditions, grease is probably a better lubrication than oil due to its ability to maintain a more effective seal against entry of abrasive foreign matter. It must be a product insoluble in water, however, due to the possibility of its having to withstand the washing action of rain, or any water used during screening. As a rule, as grease of medium body or consistency with a low pour test oil content to insure adequate fluidity at low temperatures will be best suited to these conditions, and capable of ready application by means of some form of compression cup or other pressure lubricator.

For the gears (including girth gears wherever installed) a lubricant must be used which will not only form a protective film to counteract the abrasive effect of dust, dirt, etc., but also will function irrespective of temperature, moisture or weather conditions. A straight mineral residual product will give the most satisfactory results. Usually a viscosity of approximately 200 seconds Saybolt at 210 degrees Fahr. will adequately serve the purpose in cold weather.

Vibrating Screens

In the case of vibrating screens the vibratory mechanism is somewhat more intricate than the driving gears and bearings of a rotary screen. It may, therefore, develop more potential difficulties in regard to lubrication. Grease has been found to be very satisfactory on such equipment, affording the requisite protection to the various bearings by preventing the entry of dust and dirt. As a rule some form of compression or pressure grease lubricating device should be used to insure as nearly positive lubrication as possible. In such equipment a medium bodied grease compounded with a low pour test mineral oil should meet average requirements.

(*Continued from page 86*)

tures and carried many interesting developments. The various casein exhibits along with the synthetic resins proved interesting and instructive in one of the largest and most diversified exhibits of the kind displayed.

The Government's exhibits were probably the finest ever sent any exposition and contained some extremely valuable data in the fertilizer sections and nitrate division. The exhibitors of instruments of precision contained some of the latest processes and practices as used in the chemical industries.

An outstanding accomplishment was the Student's Course under the Chairmanship of Professor W. T. Read, Head of the Department of Chemistry at the Texas Technological College, Lubbock, Texas. Over one hundred and sixty students enrolled for the course. One hundred and two were students from various education institutions and the others were professors, engineers and representatives from industry sent by their respective organizations for the purpose of taking the course. The work of all students will be closely scrutinized and credit given for all work. After the discussion a general inspection of the Exposition was made and actual demonstration of various processes explained. The lectures during the course were given by outstanding men in each particular case.

It is interesting to note that the total registered attendance for the Eleventh Exposition of Chemical Industries was about 16,000 and that the total number of visitors during the week was above 75,000. This is an indication and tangible proof that industry realizes the value and the power of chemistry in every field and phase today. The next, the Twelfth Exposition of Chemical Industries, will be held at the Grand Central Palace, New York, during the week of May 6, 1929, and it is expected that many of the technical societies in the field will take advantage of the opportunity to hold meetings at the same period.

(*Continued from page 85*)

by many people is held entirely to cheap. If the present generation has awakened to the fact that the teaching of health to the present day youth will tend toward longevity, is it not just as essential that they be coached in being careful in their work and play? That they have a thought for others welfare and that they exercise caution at all times to spare themselves and others agony, their lives and their limbs. The lessons instilled into the youth of school age become natural to them and will follow them through life, and it is only by such procedure that we can hope to eventually eliminate industrial accidents.

This education if carried through higher courses of learning will naturally broaden in scope, so that when the heads of industries in the next generation carry on their work, it will be with a fuller knowledge and conception of safety appliances and safety methods that will fit them and their subordinates for the task of making industries accidentless.

Cement Burning

A shaft or vertical kiln is fitted with a helical device down which the goods to be burned are driven, through the interior of the kiln. Drying and calcination occurs at the top, while sintering takes place in the space at the bottom, the hot waste gases moving upward through the unburnt goods. A. Andreas (German Patent 446,029).

CRUSHERS AND THEIR COMPONENT PARTS

By Wm. T. W. Miller

Part IX

PARTS one to eight, inclusive of this series of twelve articles have appeared in the past eight numbers of Pit and Quarry. In them Mr. Miller described mechanisms applied to jaw crushers, jaws and cheek plates for rock crushers, toggles and toggle bearings, lubrication, the gyratory crusher, and roll shells and centers for crushing rolls. In the ninth article, which begins below, Mr. Miller continues the subject of crushing rolls.

Mr. Miller, the author of this series, has had thirty years' experience as a specialist in crushing machinery. For the last twenty-six years he has been employed by Hadfields, Ltd., of Sheffield, England. For the past eighteen years he has been engineer-in-charge of their crushing machinery department. He has studied crushing problems in the United States, Canada, Brazil, Uruguay, Argentine, France, Spain and Portugal.—Editor.

Bearings and Lateral Adjusting Devices for Rolls

Roll bearings vary in design, in dimensions, in the system of lubrication, and in the metal used for lining the bore, they are uniform in that two o fthe four are slideably mounted whilst the other pair are usually fixtures. On the simplest rolls the bearing-blocks are plain rectangular castings with a hole bored through the center to receive the shaft, which may run directly on the cast iron or inside a brass or white metal bush as shown in Fig. 1.

The blocks are machined to fit the slides in the frames and have a retaining flange on the outside so that side movement is prevented by the wheel-bosses or collars on the shafts. They are adjusted endways by means of pinching screws pressing against one side of the blocks, and packings are inserted between the frame-pillars and the blocks to hold them rigidly in position. Lubrication is carried out through the medium of pressure grease-cups or sight-feed lubricators attached to short lengths of piping.

When the roll frames are designed in such a manner that the bearing-blocks can be fitted with retention-flanges on both sides provision may be made for swivelling bearings for the movable roll as illustrated in Fig. 2. These pivot-blocks have upper and lower circular spigots which engage with the holes in separate slide-plates so that the three pieces move in unison when the roll requires adjustment and, in the event of any irregular or out-of-line movement, the central bearing-blocks automatically regulate themselves to the new center line without overstrain on the journals, slides, or flanges.

The Sturtevant car-box bearing, Fig. 3, is an example of the simple bearing-block adapted to modern roll practice. Circular extensions are added to the rectangular base to give increased length of journal. The bearing proper consists of a babbitt metal lining run inside the bore and so disposed that the semicircle of area, below a line at forty-five degrees to the horizontal on the pressure side of the bearing, is completely filled with white metal, whilst the remainder of the interior, with the exception of a short length at either end for excluding the dust, consists of a cavity into which wool waste is packed as a reservoir for lubricant.

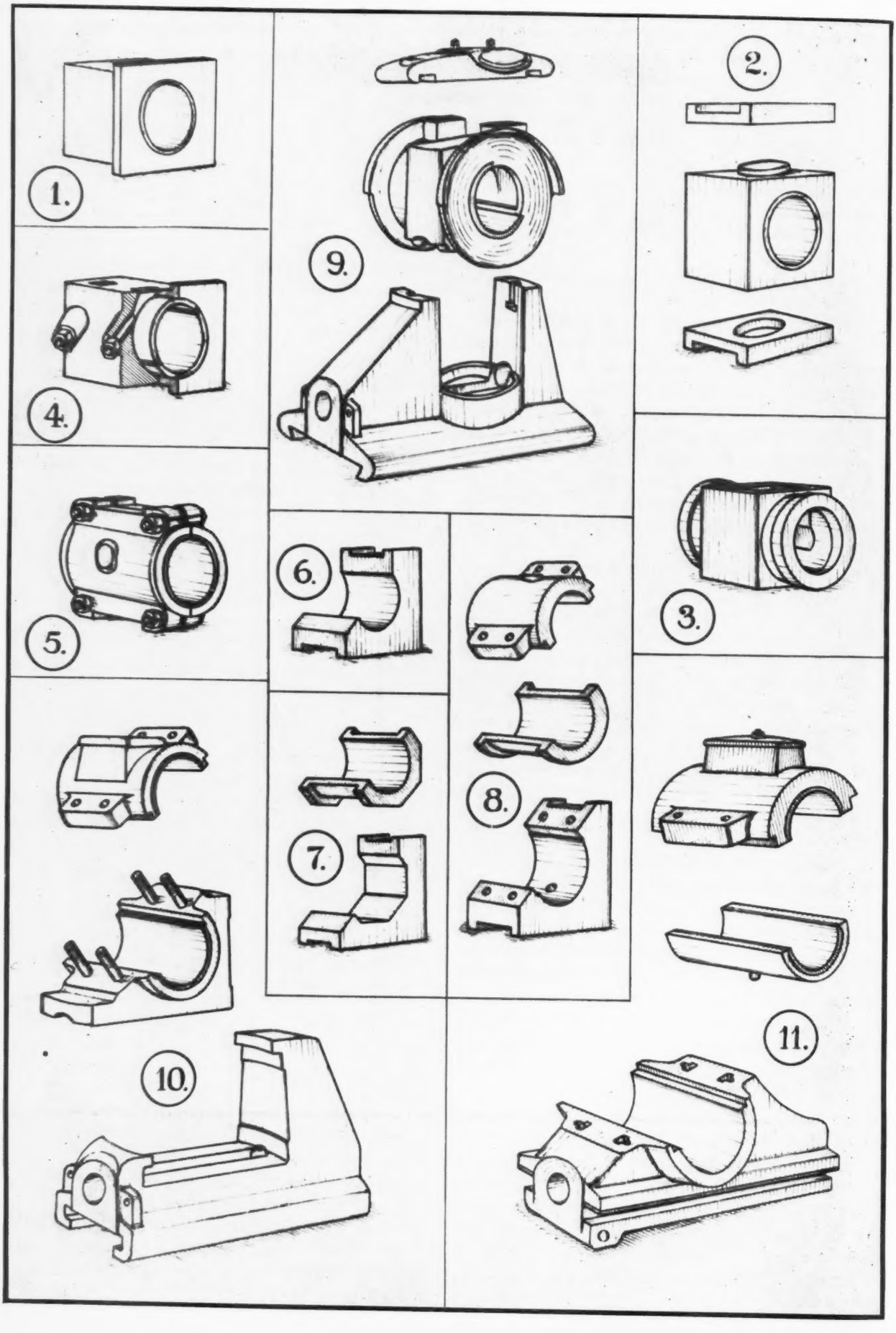
With the solid-eye bearing it is impossible to compensate for wear in the bore, and, although this may not be a very serious matter so far as the actual rotation of the rolls is concerned, there are occasions when the working conditions cause a destructive chattering due to slackness and it is obvious that excessive clearance offers a ready means of access for dust and grit to reach the journal.

Fig. 4 shows a solid bearing-block fitted with split bushes secured by cotter-bolts in such a way that, by removing the packing strips between the semicircular casings, the upper bearing can be brought closer to the lower shell to compensate for wear and exclude the dust.

The plain bearing supported in upper and lower guides is not always made as a solid casting, the design shown in Fig. 5, is popular for the clay rolls used by brick and tile works. The pillow-block is divided vertically and the halves are lined with babbitt-metal and held together by four strong bolts, each half-block has four projections which engage the frame-slides so that the bearing is guarded against side displacement.

This design is defective in so far as the division of the block is concerned. It has been proved by experience that the majority of the wear occurs in the lower half of the bearing, the resultant thrust from the work-load and the weight-load following a line about forty-five degrees to the horizontal, and to be effective any compensating adjustment should be made along this line.

In slow-moving rolls of the Cornish type the open pillow-blocks were simple castings of the shape shown in Fig. 6. The roll-shaft journals bedded directly on the cast iron and no special provision was made for covering the bearings, a piece of sacking was sometimes laid over the journal to exclude the grit and the lubricant was usually tallow plastered on the rubbing surfaces.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Although somewhat primitive these bearings were not ineffective. Cast iron of the right consistency gives a good running surface with adequate lubrication at moderate speeds and under relatively light loads, but when a bearing of this type became worn out the entire casting had to be replaced and improvements in design led naturally to the introduction of the renewable casing or liner.

Fig. 7 represents the second step in the evolution of the modern split bearing. The pillow-block was generally similar to that shown in Fig. 6, except that the opening was made semi-octagonal to receive the renewable liner in the form of a brass casting with over-hanging flanges and with bedding surfaces corresponding to the recess in the bearing-block.

The five-sided fitting faces were chosen to prevent the liner from rotating with the shaft and the surfaces were rarely machined, the old-fashioned mill-wright considering this a simple matter for handwork with hammer and chisel and file.

The introduction of the three-piece bearing with removable cap as shown in Fig. 8, was a natural progression following on early experience. The bedding surfaces between pillow-block and renewable casing were semicircular and readily machineable, and the bearing proper was either a solid brass liner or an outer shell of cast iron lined with babbitt metal.

The casing was made with an anti-rotational peg to check the bearing from sliding to the horizontal by its own weight during the erection process, when the cap was bolted down it clamped the bottom liner in position, effectively preventing independent rotation. The cap was of cast iron bored to bed on the shaft, or, in some instances, lined with white metal, and fitted for grease or oil lubrication.

Broadly speaking the bearings for the modern high-speed rolls may be divided under three classifications, the one-piece car-box swivelling type which have to be lifted with the shafts, the split bearings with removable caps and with swivel brackets for the movable roll, and the split bearings without swivel attachments. The two latter classes might be further subdivided into those fitted with renewable casings and those in which the babbitt metal is run directly into the bearings.

The first series would include machines such as Gates Highgrade, Worthington Garfield type, the Allis-Chalmers "XX" Rolls, and the Traylor Ajo design. Under the second classification might be placed the Allis-Chalmers Style "B" and Anaconda Rolls and many others, and the most widely known machines in the third class would be the Traylor Styles "A" and "AA" rolls.

Fig. 9 illustrates the one-piece bearing and sliding carriage as fitted in the original Gates Highgrade rolls. The journal-boxes for both fixed and movable rolls are generally similar; the two latter being supported by sliding brackets whilst the former were fitted in recesses in the frame. The bedding surfaces in pedestal and bedplate were machined to a radius struck from the center of the bearing so that each block could turn freely in a horizontal plane.

The bearings were lined with babbitt metal but the lining was cut away on the non-pressure side to form a large chamber which was filled with woolen waste saturated with oil. Two hand holes were provided in each block to give access to the interior for examination of the journal and entry for the lubricant. The ends of the bearings were flanged, with overhanging semicircular dust shields, giving ample contact surface for the shaft-collars, and some measure of protection against the abrasive action of the dust. The sliding brackets were made with basis of sufficient length to give stability and broad enough to include good wearing surfaces, the dovetailed edges registering with the frame slides, were of ample length to resist the side strains and reduce any tendency lift or rock to a minimum. The bearing-blocks were secured in their recesses by heavy covers to which were attached dust-proof flaps of leather or rubber with weighted discs to seal the hand holes.

The swivelling bearing with cap and sliding saddle, as shown in Fig. 10, is probably the oldest combination of this kind in use at the present time. When this construction is adopted the bearings for the fixed-roll shaft are usually, although not invariably, integral with the frame. In some cases, as previously mentioned, they are fitted with renewable bearing-casings although such are not indicated in the figure.

The ends of the pedestal are turned with the center of the bore as pivot point and the bedding faces in the cradle are bored to the same diameter so that the bearing can right itself quickly to any angular displacement. The parts are assembled by resting the pedestal on the base of the recess in the sliding-bracket in such a manner that the vertical axis of the bearing is directly over the center of the bore whilst the axis of the journal is at right angles to its true working position.

The pedestal is then turned on its center until it enters the bore of the cradle and registers correctly with the buttress-end of the bracket when it is locked against side movement by the chamber of the vertical faces and held down on its seating by overhanging lugs on the base casting. The hole for the tension-rod passes through the body of the cradle directly under the seating for the pedestal in order to bring the line of pull as close as possible to the shaft-center. The under-surfaces of the sliding carriage are sometimes faced with renewable wearing strips and the grooved guide-ways may be either rectangular as shown or dovetailed as in Fig. 9.

PROGRESS OF ASPHALT PAVING INDUSTRY

THE Asphalt Association was organized in May, 1919, to develop the use of asphalt for paving. No industry in recent years, it is believed, has made greater strides than has the asphalt industry. The industry according to official reports issued by the U. S. Bureau of Mines has shown a gain from 1,445,178 tons in 1919 to 4,316,282 tons in 1926 or 200 per cent. The yardage of asphalt pavements laid annually from 1919 to 1926 has increased from 55,000,000 sq. yds., to 133,000,000 sq. yds., respectively. In 1910 the yardage of asphalt pavements laid was only 18,000,000 sq. yds.

Through the tests, investigations and experiments of the research department of The Asphalt Asosciation, asphalt pavements are being constantly improved and their durability and serviceability extended.

For the first time in the history of asphalt, due to the efforts of the Association, there is now a comprehensive and up-to-date literature, technical and popular on the subject of asphalt and the various types of asphalt pavements; the construction materials and methods have been more nearly standardized and simplified and better results with the various paving mixtures are being obtained.

Headquarters of The Asphalt Association are located at 441 Lexington Avenue, New York City, with branch offices in Albany, N. Y., Toronto, Canada, Charlotte, N. C., Chicago, Ill., New Orleans, La., and Washington, D. C.

The officers of The Asphalt Association for the year 1927 are: J. S. Helm, New York City, President; Leroy M. Law, New Orleans, Vice President; Herbert Spencer, New York City, Treasurer, and J. E. Pennybacker, New York City, Secretary and General Manager. Messrs. Helm and Spencer are connected with the Asphalt Department of the Standard Oil Company of New Jersey, and Mr. Law is connected with the New Orleans Refining Company. Prior to his appointment as General Manager of The Asphalt Association, Mr. Pennybacker was Chief Economist for the U. S. Bureau of Public Roads.

The Board of Directors of The Asphalt Association includes, besides Messrs. Helm, Spencer and Law, Messrs. F. A. Hogan, Manager of the Asphalt and Road Oil Department, Imperial Oil, Ltd., Toronto, Canada; Fisher Jones, Manager, Asphalt Department, Mexican Petroleum Corporation, New York City; H. B. Carpenter, Manager, Asphalt Department, Midwest Refining Company, Denver, Colorado; C. C. Larkin, Manager, Asphalt Road Oil Department, Standard Oil Company of Indiana, Chicago, Illinois; B. L. Boye, Assistant Manager, Asphalt Department, Standard Oil Company of New York, New York City, and E. J. Morrison, President, Hastings Pavement Company, New York City.

The Research Department is under the direction of Prevost Hubbard, formerly Chief of Research, United States Bureau of Public Roads, and F. C. Field, formerly city chemist of Seattle, Washington and Calgary, Canada. The statistical and traffic work is in charge of W. E. Rosengarten, formerly with the United States Bureau of Public Roads, and the advertising and publicity are looked after by C. S. Lee, formerly with The American Road Builders' Association.

W. H. Rhodes, formerly with the Louisiana and Oklahoma State Highway Departments, has charge of the southern branch of the association at New Orleans; George W. Craig, formerly city engineer of Omaha, Nebraska, is manager of the middle western branch at Chicago; Vibert L. Ostrander, formerly deputy state highway commissioner of New York State, is manager of the eastern branch with headquarters at Albany; Lloyd D. Smoot, formerly director of public work of Jacksonville, Florida, is manager of the southern branch at Charlotte, North Carolina; E. H. Scott is manager of the Canadian branch, with headquarters in Toronto; C. S. Lee is manager of the Washington branch, in the National Capital; the work in Georgia and Alabama is handled by W. A. Crossland; the work in Florida by W. C. Ricketts, while W. D. Craig works from the Chicago office.

The association sponsors an annual asphalt paving conference which is attended by hundreds of city, county and state highway officials, as well as asphalt technicians, material men, engineers and contractors. The Sixth Annual Asphalt Paving Conference will be held during the last week in November at Atlanta, Georgia, where the first conference was held six years ago. Other paving conferences under the auspices of the association have been held in Denver, Colorado; Louisville, Kentucky; Detroit, Michigan, and Washington, D. C. At these conferences there are thorough discussions of the latest methods and materials evolved for the construction of the various types of asphalt pavements. Highly instructive and interesting technical papers are presented by noted engineers and material men, and there are always interesting and delightful entertainment features.

Asphalt as a material now enters into practically every type of street and road paving known. Asphalt is used for filling cracks, for expansion joints and for resurfacing concrete roads; it is used as a filler for brick and granite block pavements, and it is, of course, the binder material for asphalt macadam, asphaltic concrete, sheet asphalt, asphalt block and all of the other types of asphalt pavements.

PIT AND QUARRY FOREIGN DIGEST

New Reciprocating Motion Conveyors

Mechanical handling problems are capable of a great variety of solutions depending upon the nature of the product distributed and the conditions of its receipt or redivision. Continuous conveyors such as rubber or flexible steel belts or bucket conveyors are frequently employed. Screw conveyors are useful with powders or fine granules.

The new conveyor is particularly applicable to the following cases (1) Conveying products in bulk

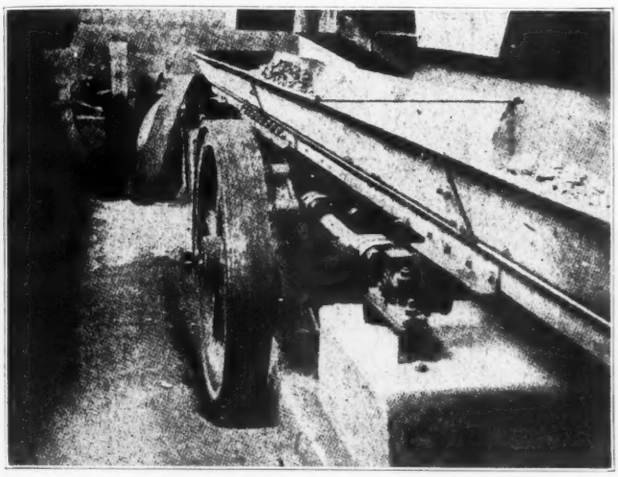


Figure Two

of extremely variable particle size, from pieces of 75 to 100 lbs. down to a powder. (2) Conveying materials at high temperature. (3) Charging raw material at any desired point. (4) Distribution of products at several points simultaneously in regulated proportions, and (5) Simultaneous sorting and conveying of products. The new conveyor consists essentially of a trough, the size of which depends upon the capacity desired and activated by a reciprocating longitudinal movement. A simple control mechanism furnishes a propulsive movement to the hopper on which the material is projected a definite distance for each revolution. Figures 2 and 3 show illustrations of this conveyor. C. Candlot (Le Ciment, September 1927. pp. 327-329).

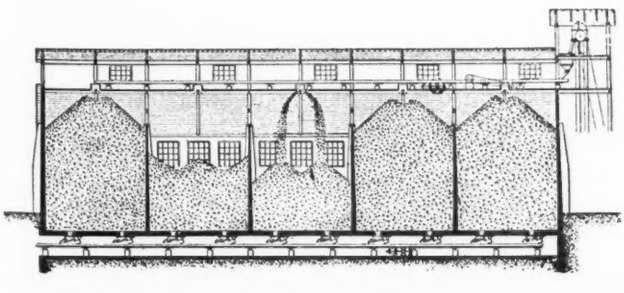


Figure Three

Difficultly Soluble Material

Pure sand, precipitated or melted clay, calcium carbonate, soda, a mixture of 10% soda and 90% clay, fluorspar and a mixture of 10% fluorspar with 90% clay, were pressed into pellets of varying water content, heated and pressed. In all cases the strength of the resulting pellet increased with increasing water content and increasing temperature of heating. Only in the case of the sand pellets which were heated to 500 degrees C. before being pressed, did the strength decrease with increasing water content. The role of the water is so clear that it makes possible an estimation of the particle size in the pellets. B Garre (Keram. Rdsch. *35*, 513-514).

Linings for Cement Kilns

A cheap firebrick, fairly dense is suitable for the drying zone. For the pre-heating zone, a dense non-porous fire brick is essential due to the abrasive action at this point. In the calcining zone the lining must be capable of withstanding the corroding action of lime at high temperatures. A firebrick of the composition 62% SiO_2, and 32% Al_3O_2, is satisfactory for this zone. The brickwork in the sintering zone is exposed to great corrosion and abrasion by the continual movement of alkaline materials as well as to strain caused by the rotation of the kiln. The proper lining for this zone is not yet agreed upon. A kiln with a fire brick lining, the latter being covered with cement clinker and cement gave good results. Alternate layers of high and low alumina brick gave fair service. Bauxite has been found satisfactory except for its tendency to shrink. G. Martin (Trans. Ceram. Society *25*, 394-399).

Stone Crushers With Vibrating Jaws

In a stone crusher with a fixed jaw and a movable jaw driven by an eccentric and fast with a rearward extension serving as the eccentric rod, the movable jaw is hung on pivots which are horizontally displaceable in slide ways. The eccentric rod which transmits the drive of the eccentric to the movable jaw is adjustable for altering the width of the throat of the crusher. A. Müller (British Patent 275,100).

Magnesite Cement

Ferrous chloride is rendered anhydrous by drying the crystallized chloride or by rapid evaporation of a solution of the salt and the ground product intimately mixed with magnesium oxide and suitable fillers, forming a magnesite cement which can be stored or transported without deterioration and used without skilled labor. J. Agerup (British Patent 268,989 & B. C. A.)

Volume Weight of Portland Cement

A new apparatus has been devised based on the following considerations for the determination of the density of cement. (1) The greater the amount of cement used for the test, the lower the error, therefor, a 2 liter vessel was used. (2) The container must be proportionately shallow so that the air may escape easily. (3) A double lid on the top of the upper box makes possible the dropping of the cement over the full width of the apparatus. (4) The entire apparatus is enclosed in a box. Figures 4 and 5 illustrate this new apparatus. K. Goslich. (Zement, September 22, 1927. pp. 895-897).

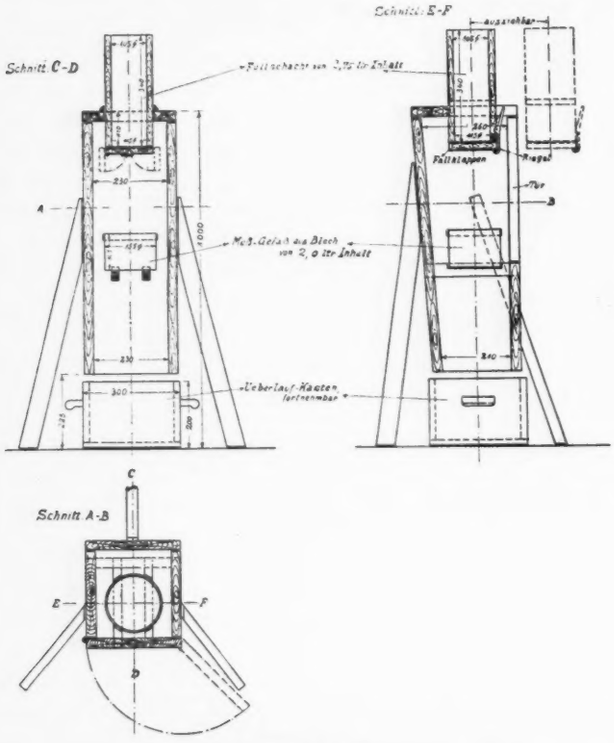


Figure Four

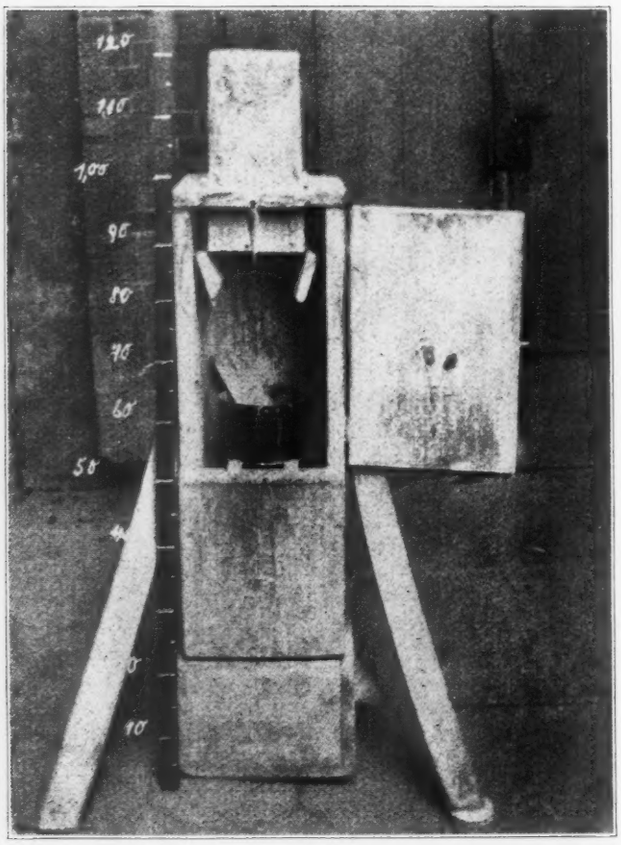


Figure Five

Linings for Lime Kilns

Fifty varieties of stone linings were tested to ascertain the damage to the refractory linings due to the burned and unburned lime. The corrosion is greatest when equal parts of clay and silicic acid are used in the stone. Protective coatings with zirconium oxide or aluminum oxide are very good but soon rub off. Quartz and silica stones are usable because the silicates formed melt at high temperatures and even then are very thick fluids. At temperatures over 1400 degrees magnesite should be used. H. Hirsch (Tonind. Ztg. 51, 816-820. 836-839).

Alkaline Earth Carbonates

In the burning of alkaline earth carbonates, such as limestone, dolomite and magnesite, the material is spread in a layer on a pervious support and heating gases are passed therethrough, the carbon dioxide being removed as rapidly as it is formed, by the stream of gases. The temperature is maintained at a point between the decomposition and melting temperatures of the material. A. E. White (British Patent 275,463).

Rock Drills

In order to prevent corrosion of the bore of a drill shank by the clearing water, the bore is coated internally with non-corroding layer, formed by deposition thereon or otherwise of pure iron, non-corroding metals such as nickel, or non-corroding alloys such as chrome iron alloy. A tube of the appropriate metal may be incorporated in the bore before the shank is rolled down. Alternatively a coating of paint or varnish may be employed, removed as required. L. Pryce (British Patent 275,560).

Kilns

In order to facilitate charging and discharging the chambers of a continuous kiln are roofed by movable slabs. The slabs run on rails on the sides of the chambers and can be run at the end of the chamber onto a transfer platform. Alternatively the slabs may be moved by a travelling crane or they may be adapted to turn about one edge into a vertical position. M. Bisch (British Patent 275,616).

INTIMATE NEWS OF MEN AND PLANTS

New California Plant

Heade by James A. Moore as president, a group of Californians have completed the organization of the Chemical Products Corporation for the purpose of erecting a soda ash plant on the shores of Owens Lake, near Los Angeles. The first unit of the plant, which will be capable of producing 50 tons of soda ash per day and which will be in operation the first part of 1928 will represent an outlay of over $100,000. Perpetual mineral rights to 763 acres of the lake bed have been acquired, which is reported to be covered by a large deposit of natural sodium carbonate.

New California Cement Plant Will Soon Operate

Actual quarrying operations on lime deposits at the site of the $750,000 cement plant near Devore in the Cajon Pass, California, will begin in the latter part of October, according to Bryant Young, president of the American Portland Cement Company, which is opening the project to obtain materials for the Houghton process of building construction.

Open Molybdenum Deposit

The Molybdenum Corporation of America will soon begin extensive development of the molybdenum mining properties on Aeneas mountain near Tonasket, Washington. The Molybdenum Corporation acquired the mine on Aeneas mountain, west of Tonasket, on which prospecting has been carried on by its former owners for several years. They had opened up an ore body of sufficient extent to satisfy expert mining engineers that still further development work was justified.

The company's plans show a tunnel 1,000 feet in length which will open up the mine at approximately 200 feet greater depth than the present workings. Work on this tunnel is to be begun immediately and rapidly pushed in order to secure a large ore tonnage before erecting a plant. If the tunnel proves a mine coming up to the expectations of the company it is their plan to immediately erect a large concentrating plant on the property for the reduction of the ore and the concentrates will be shipped from Tonasket to the company's works at Washington, Pennsylvania, for conversion into ferro-molybdenum, in which state it is used in the manufacture of molybdenum steel.

New Gypsum Plant for West

Announcement has been made by the United States Gypsum Company that a gypsum manufacturing plant will be built at Midland, California. For fifteen years before the site was chosen the company's geologists and other experts sought a gypsum deposit of adequate purity for the manufacture of casting, moulding and other plasters, and properly located for the servicing of the Pacific Coast markets.

The quality of the gypsum rock at Midland is unique. It is equal in purity and whiteness to the world-famous deposit at Southard, Oklahoma. Other gypsum products used on the coast are manufactured from gypsum which is imported from foreign countries.

The Midland plant will be the twenty-third manufactory in the United States operated by the United States Gypsum Company. It will bring new industry to the Pacific Coast and will provide employment for labor and revenue for railroads. It also will make California independent of foreign nations as far as gypsum products are concerned.

In anticipation of the completion of the Midland manufactory, the United States Gypsum Company has installed warehouses at Portland, Seattle, San Francisco, Oakland and Los Angeles. Stocks of Midland manufactured gypsum products will be carried at these warehouses.

E. E. Evans Active in Safety

E. E. Evans of Toledo, president of the Whitehouse Stone Company and of the Ohio Crushed Stone Association has been made chairman of the quarries section of the Ohio Safety Congress to be held in Columbus Nov. 9th and 10th under the auspices of the state industrial commission. Mr. Evans is preparing the program for the quarry section meeting and it is expected that several of the leading quarry safety authorities in the United States will appear on the program.

New Asphalt Mine

Mining of asphalt rock on a large scale was started near Cline, Texas, recently by the Limestone Rock Asphalt Company. It is stated on good authority that the deposit which the company owns is very large and the material runs high in asphalt. It is being chiefly used for road building purposes. B. Y. Sharp is manager of the property.

34076

New Alabama Geologist

On October 1 Dr. W. B. Jones became state geologist for Alabama, succeeding Dr. Eugene Smith, who died, September 7, after serving in that capacity for more than fifty years For several years past Dr. Jones was assistnat state geologist.

Dr. Jones was born February 25, 1895, at Huntsville, Alabama, the son of State Senator George Walter Jones, and Elva Lena (Moore) Jones. He was graduated from the University of Alabama in 1918, and received his M. A. degree from the same institution in 1920. His Ph.D. in geology was received from Johns Hopkins in 1924.

During 1918-1919 he was in the engineering corps of the army; 1920-22 geologist for the Compania Meicana de Petroleo (El Aguila) Tampico, Mexico, and part of this period an instructor in geology at the University of North Carolina. Since 1924 he has been connected with the Alabama Geological Survey.

New Incorporations

Owsley Sand & Gravel Co., Houston, Tex. $50,000. H. F. Owsley, D. S. Harston, Elton M. Hyder.

Pacific Rock & Gravel Co., Centerville, Calif. $25,000. Lee Fontz, Pleasanton, Calif. Plant will be constructed immediately.

Webster Gravel Co., Minden, La. $12,000. W. T. Drew, W. P. Devereaux, R. E. Lee.

Raleigh Sand & Gravel Co., Inc. $100,000. (Corp. Trust Co. of America, Wilmington, Del.)

Hudson Valley Sand & Gravel Corp. $20,000. (J. M. Klein, 2 Lafayette St., New York City).

Maloy-Riggs Sand & Gravel Co., Albany, N. Y. $20,000. (H. J. O'Keefe, Albany).

Florida Crushed Stone Co., Jack Camp, Tampa, Fla. $100,000. E. F. Fitch, Frank Drake.

American Art, Marble & Granite Co., 4207 Suwanee Ave., Tampa, Fla. W. C. Zickgraf, Pres.

New Lime Plant Opens

The new lime plant of the Bruns Hydrated Lime Company opened recently at Woodville, Ohio. Three kilns of the six kiln plant were started and will be kept going and as the demand for the lime increases the other kilns will be fired. Charles Kaemming is president of the company.

DISTRIBUTION OF CEMENT

Portland cement shipped from mills into States, in July and August, 1926 and 1927, in barrels*

Shipped to	July		August	
	1926	1927	1926	1927
Alabama	184,577	207,386	173,019	243,841
Alaska	1,386	2,029	1,130	338
Arizona	35,817	38,125	45,553	34,598
Arkansas	73,292	72,502	71,312	85,164
California	1,173,099	1,077,710	1,165,387	1,158,661
Colorado	117,990	113,490	133,172	124,628
Connecticut	218,375	258,232	224,946	239,392
Delaware	38,228	18,765	35,287	40,815
District of Columbia	94,852	105,400	75,684	103,217
Florida	284,281	166,647	330,285	180,328
Georgia	213,432	179,713	188,201	193,713
Hawaii	12,761	34,500	8,895	28,219
Idaho	47,991	28,166	44,589	30,000
Illinois	1,857,871	1,962,942	†1,806,446	2,066,172
Indiana	698,427	771,651	†702,574	868,669
Iowa	353,529	486,109	412,046	602,653
Kansas	230,022	263,430	260,169	251,022
Kentucky	280,154	239,555	†175,705	283,184
Louisiana	2,958	147,449	121,260	147,709
Maine	67,475	82,034	108,161	81,018
Maryland	221,600	272,142	208,790	366,046
Massachusetts	331,320	290,232	349,319	314,527
Michigan	1,504,056	1,360,516	†1,570,296	1,788,820
Minnesota	475,846	419,976	437,014	480,599
Mississippi	89,752	102,252	80,109	111,007
Missouri	653,615	481,281	611,020	560,364
Montana	38,749	39,521	31,256	50,776
Nebraska	172,489	150,181	201,211	180,063
Nevada	7,878	10,139	9,088	6,149
New Hampshire	55,233	50,796	49,958	56,223
New Jersey	793,625	844,190	691,453	853,588
New Mexico	14,736	18,160	21,231	23,750
New York	2,336,788	2,467,699	2,329,217	2,749,722
North Carolina	396,618	321,348	376,779	340,093
North Dakota	62,581	71,813	43,493	69,872
Ohio	1,272,308	1,166,296	†1,235,463	1,381,581
Oklahoma	205,345	287,638	236,223	298,452
Oregon	151,296	187,401	128,525	188,586
Pennsylvania	1,618,569	1,573,559	1,493,733	1,706,430
Porto Rico	.....	3,000	.....	3,500
Rhode Island	65,525	69,599	66,573	85,312
South Carolina	53,506	63,414	62,408	103,455
South Dakota	46,987	50,896	44,054	50,994
Tennessee	213,058	269,184	207,528	285,835
Texas	481,008	436,475	484,822	533,591
Utah	50,306	41,478	54,276	60,332
Vermont	38,607	45,365	49,660	67,255
Virginia	180,085	195,133	182,011	211,679
Washington	239,146	299,400	198,993	335,681
West Virginia	214,948	194,693	†162,494	239,578
Wisconsin	704,770	853,526	715,784	1,035,131
Wyoming	19,973	20,374	24,901	22,131
Unspecified	599	29,843	†70,233	23,887
	18,727,439	18,948,355	†18,512,336	21,348,350
Foreign countries	84,561	35,645	70,664	62,650
Total shipped from cement plants	18,812,000	18,984,000	18,583,000	21,411,000

*Includes estimated distribution of shipments from three plants in July and August, 1927; and from five plants in July and August, 1926.
†Revised.

Production, shipments, and stocks of finished Portland cement, by districts, in September, 1926 and 1927, and stocks in August, 1927

(Figures represent thousands of barrels).

Commercial District	Production September		Shipments September		Stocks at end of September		Stocks at end of Aug.*
	1926	1927	1926	1927	1926	1927	1927
Eastern Pa., N. J. and Md.	3,936	4,058	4,593	4,596	2,718	3,469	4,007
New York	948	1,273	1,194	1,468	596	1,170	1,365
Ohio, W. Pa. and W. Virginia	1,797	1,804	1,903	2,352	1,930	1,734	2,284
Michigan	1,415	1,692	1,614	1,869	1,062	1,080	1,257
Wis., Ill., Ind. and Kentucky	2,326	2,472	2,451	2,564	1,792	1,139	1,231
Va., Tenn., Ala., Ga. and La.†	1,368	1,458	1,428	1,490	1,029	1,114	1,145
E. Mo., Ia., Minn. and S. D.	1,470	1,481	1,556	2,014	*1,992	1,204	1,737
W. Mo., Neb., Kan. and Okla.	1,046	1,033	970	1,187	1,407	1,312	1,466
Texas	437	487	438	466	417	272	251
Colorado, Montana and Utah	247	174	288	249	384	384	458
California	1,272	1,200	1,318	1,214	458	704	718
Oregon and Washington	309	360	334	359	*403	374	373
	16,571	17,492	18,087	19,828	14,188	13,956	16,292

*Revised
†Began producing June, 1927, and shipping July, 1927.

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in August, 1927*

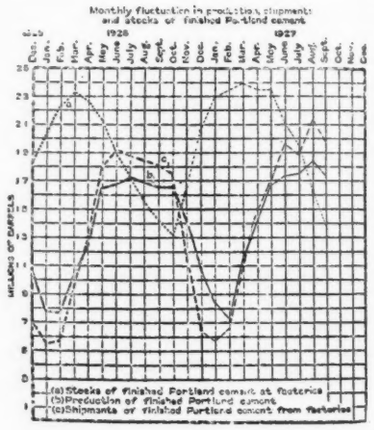
	Barrels	Value
Alaska	2,060	$ 6,307
Hawaii	34,792	92,256
Porto Rico	6,580	17,171
	43,432	$115,734

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

SEPTEMBER CEMENT STATISTICS

September, 1927, production and shipments of Portland cement were at nearly the record high rate set in August and were nearly 6 and 10 per cent, respectively, greater than in September a year ago, according to the Bureau of Mines, Department of Commerce. Portland cement stocks are still diminishing and are slightly under those on September 30, 1926.

During the 9 months ending September 30 shipments amounted to


Monthly fluctuation in production, shipments and stocks of finished Portland cement
1926
1927
Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
MILLIONS OF BARRELS
(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement
(c) Shipments of finished Portland cement from factories

134,981,000 barrels, surpassing the shipments in the corresponding period in 1926 by nearly 7 per cent.

The output of another new plant, located in California, is included in these statistics, which are compiled from reports for September, 1927

Relation of production to capacity: Review of the estimates published a month ago has been made in the light of the record of monthly production of the individual cement plant in 1926 and 1927, resulting in material upward revision of the estimates. The capacity demonstrated by rates of production sustained over continuous periods of three months by each of the plants indicates a total capacity for the year 1926 of at least 215,300,000 barrels. Since January 1, 1927, new plants and extensions and betterments in old plants have raised this capacity on August 31, 1927, to at least 228,300,000 barrels a year and on September 30, 1927, to at least 229,020,000 barrels. On the basis of these revised estimates the 1926 production amounted to 76.4 per cent of capacity, the August, 1927, output represented approximately 94.4 per cent of the capacity of the plants for that month, and the production for the first 8 months of the year was 75.2 per cent of the capacity available during that period. Corresponding figures for September and for the first 9 months of the year are 92.2 per cent and 77.2 per cent, respectively.

Production, shipments, and stocks of finished Portland cement, by months, in 1926 and 1927

(Figures represent thousands of barrels).

Month	Production		Shipments		Stocks at End of month	
	1926	1927	1926	1927	1926	1927
January	7,887	8,258	5,674	5,968	20,582	22,914
February	7,731	7,377	5,820	6,731	22,385	23,560
March	10,390	11,452	9,539	11,083	23,236	23,922
1st quarter	26,008	27,087	21,033	23,782	.....	.....
April	12,440	14,048	12,965	14,350	22,710	23,654
May	16,510	16,701	17,973	16,865	21,255	23,503
June	16,866	17,224	19,134	19,761	19,000	20,972
2nd quarter	45,816	47,973	50,072	50,975	.....	.....
July	17,134	*17,408	18,812	18,984	17,301	19,397
August	16,995	*18,315	18,583	21,411	15,718	*16,292
September	16,571	17,492	18,087	19,828	14,188	13,956
3rd quarter	50,700	53,215	55,482	60,223	.....	.....
October	16,596	.....	17,486	.....	13,334	.....
November	14,193	.....	11,276	.....	16,243	.....
December	10,744	.....	6,432	.....	20,616	.....
4th quarter	41,533	.....	35,194	.....	.....	.....
	164,057	.....	161,781	.....	.....	.....

*Revised.

EXPORTS AND IMPORTS*

Exports of hydraulic cement by countries in August, 1927

Exported to	Barrels	Value
Canada	2,274	$ 10,476
Central America	2,695	8,847
Cuba	7,137	19,863
Other West Indies	9,599	17,815
Mexico	4,444	13,875
South America	27,401	96,264
Other countries	7,821	42,058
	61,371	$209,198

Imports of hydraulic cement by countries, and by districts, in August, 1927

Imported from—	District into which imported	Barrels	Value
Belgium	Florida	24,490	$ 29,535
	Maine and New Hampshire	3,000	3,648
	Massachusetts	47,091	73,447
	New Orleans	3,000	3,685
	New York	200	370
	Oregon	3,000	4,061
	Porto Rico	2,585	4,965
	Washington	7,339	9,753
	Total	90,705	129,464
Canada	Alaska	5	25
	Maine and New Hampshire	1,018	2,329
	Saint Lawrence	3,250	6,740
	Total	4,273	9,094
Chile	New York	6	10
Denmark	New York	751	2,998
	Porto Rico	2,993	4,564
	Total	3,744	7,562
Norway	Los Angeles	500	581
	New York	872	1,331
	Philadelphia	12,000	14,166
	Virginia	25	46
	Total	13,397	16,124
United Kingdom	New York	1,489	3,270
	Porto Rico	3,991	4,643
	Total	5,480	7,913
	Grand total	117,605	$170,167

Exports and imports of hydraulic cement, by months, in 1926 and 1927

Month	Exports				Imports			
	1926		1927		1926		1927	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	72,939	$ 216,431	75,346	$254,072	360,580	$ 576,600	193,175	$269,661
February	73,975	220,706	71,404	233,985	308,161	527,948	130,421	200,680
March	69,080	205,647	67,956	240,165	493,241	812,968	181,145	261,519
April	96,296	284,772	72,383	243,832	257,302	398,114	191,868	313,262
May	78,601	224,365	59,332	205,574	223,130	337,031	178,929	263,618
June	80,684	248,814	69,205	237,281	323,656	495,744	129,111	201,682
July	130,822	370,220	72,337	229,737	250,862	395,981	175,035	249,665
August	64,946	216,489	61,371	209,198	350,638	560,532	117,605	170,167
September	70,920	239,174	.....	.....	194,129	308,224	.....	.....
October	69,389	225,874	.....	.....	263,403	386,335	.....	.....
November	76,698	238,103	.....	.....	55,225	82,949	.....	.....
December	89,976	305,238	.....	.....	152,059	242,974	.....	.....
	974,326	$2,995,833	.....	.....	3,232,386	$5,125,400	.....	.....

Gruendler Crushing Units

The adage that "necessity is the mother of invention" finds new expression in the types of machines now being offered to solve the crushing problems of cement, gypsum and crushed stone producers. Among these are the crushers offered by the Gruendler Patent Crusher and Pulverizer Company, described in a very attractive booklet recently issued by that concern. A four page spread in the center of this booklet gives in reverse etchings some stone crushing, gypsum plant and cement plant installations which should be of value to those interested in planning layouts for plants of this kind. Among the crushers described are swing hammer crushers, jaw crushers and double roll crushers.

The crushing range of the swing hammer crusher is from 12 inches to 95 per cent passing 100 and in the gypsum or cement plant finds special use in reducing large stone to as fine as ⅛ inch mesh in one operation. The jaw crusher is a highly developed machine, qualifying as a preliminary crusher. The main frame is made of semi-steel to withstand the largest and most severe service. The jaw plates are made of manganese steel, corrugated, best suited for flinty and very hard rock. It is equipped with a Pittman movable jaw and wedge block, made of cast steel, to prevent breakage should foreign material enter crusher. The toggle plates which are fused so as to break, should crusher be overstrained, rest in renewable seats which are made of tool steel to give years of service before renewing. The Pittman is babbited on the main shaft whose center is very large to stand the stress. All bearings are of split type so as to take up wear. This machine is adjustable for crushing fine or coarse while in operation. One of many features is the very few parts which are used, which means lower upkeep and no danger of getting out of order.

Where a minimum amount of fines is desired, such as in briquetting, roofing granules, these slow motion, powerful, double roll crushers are found very useful. Their reduction is 2 inches to 30 mesh. For greater uniformity from two to as high as six pair rolls are desirable. Two styles are made, compound gear and double belt without gears. Some of the more common uses are crushing of slag and cinders, dry or wet, slate and marble granules, coal for stokers, briquetting, heavy chemicals and for granulation with very little fines. The double roll crushers are manufactured in diameters of 18, 24, 36, 42, 60, 72 inches and in various widths from 12 inches to 48 inches.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,642,753. Forming concrete structures. Charles E. Roop, Richmond Heights, and Leo M. Dieckmeyer and Constantine B. Barutio, St. Louis, Mo., assignors to Stevens Engineering & Construction Co., St. Louis, Mo.

1,642,826. Rotary scraper with automatic elevating control. Joseph S. Reynolds, Long Beach, Calif.

1,642,885. Mining apparatus. Edmund C. Morgan, New York, N. Y.

1,642,893. Casting in situ of concrete building structures. George W. Rawlings, East Ham, London, England.

1,643,048. Jaw or breaker plate for stone crushers and the like. Poul Bechgaard, Dalby, Sweden.

1,643,136. Process of manufacturing cementitious material. Henry S. Spackman, Ardmore, Pa.

1,643,137. Hydraulic cement and process of making the same. Henry S. Spackman, Ardmore, Pa.

1,643,220. Mining-machine. Robert B. Metzner, Wheeling, W. Va.

1,643,221. Mining tool. Robert B. Metzner, Wheeling, W. Va.

1,643,704. Power shovel. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,644,181. Cutter-chain. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,644,183. Mining-machine. Edward J. Doberstein, Blue Island, Ill., assignor to Goodman Mfg. Co., Chicago, Ill.

1,644,216. Mining-machine. Robert J. Wood, Twin Branch, W. Va., assignor to Goodman Mfg. Co., Chicago, Ill.

1,644,227. Mining-machine. Allan B. Benedict, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,644,274. Draft-operated scraper. Clarence F. Poole, Evanston, Ill., assignor to Goodman Mfg. Co., Chicago, Ill.

1,644,288. Method of excavating. Oscar E. Strehlow, Evanston, Ill.

1,644,345. Mining-machine. William T. McCullough, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,644,743. Grab. Almon E. Norris, Brookline, Mass.

1,644,943. Mining-machine. Robert C. Osgood, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,645,002. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,645,003. Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,645,004. Controlling mechanism. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,645,007. Mining-machine. Harry C. Johansen, Michigan City, Ind., assignor to Sullivan Machinery Co., Claremont, N. H.

Harbor Sand Planning Improvements

A new storage bunker, a gravel washing and screening plant and a new rock crushing plant will be constructed on a Chehalis river site near Montesano, Washington, by the Harbor Sand and Gravel Company.

The new bunkers in Montesano will have a capacity of 800 yards of sand and gravel per day and will have both water and rail transportation facilities. A Sauerman drag line cable will be installed to convey the sand to the hoppers and thence by conveyors to the washing and screening plants. From the bunkers the material will be loaded on barges or cars for distribution.

Because of the increasing demand for crushed rock, the company will install a large crusher and will be able to supply this product in large quantities.

New Lime Product

Plans to market a new lime wall-finishing process developed in Lonsdale, Tennessee, by W. K. Hunter and M. F. Nichols will proceed when a charter applied for is granted. The new process is the outcome of three years' research and is intended to open up a new industry for the south. Heretofore, material for the outer finish of plaster walls has been imported from the north.

The charter application calls for a capital stock of $100,000 and the investors named are: W. K. Hunter, Isola Hunter, M. F. Nichols, Nellie N. Nichols, and William M. Nichols. The corporation will sell patent rights to lime companies and will not attempt to manufacture. The patent on the process was obtained last July.

Diamond Lime Company Buys

The Diamond Lime Company of Diamond Springs, California, has bought out the Sierra Lime and Minerals Company of Sacramento.

Safety in Motion Pictures

In connection with the campaign to reduce the number of accidents to children from playing with blasting caps, the Institute of Makers of Explosives has just prepared a one-reel motion picture film entitled "How Jimmy Won the Game." This film shows forcefully and in a way which can be understood by the children the dangers of a blasting cap as a plaything. It is based on a story of a baseball game in a small town. It is proposed to offer this film to schools and safety meetings. Copies of it can be had by addressing C. Stewart Comeaux, Secretary, Institute of Makers of Explosives, 103 Park Avenue, New York City.

In a survey recently conducted by the Institute, it was shown that there are approximately 500 children blinded or injured each year as a result of playing with blasting caps. Most of these accidents occur in rural districts and are due in every case to the carelessness of adults, who leave these objects about where they can be found by the children.

Totally Enclosed Motors For Portable Hoists

General Electric has announced a new line of motors for portable electric hoists and suitable also for other applications involving intermittent operation and high starting torque. The line runs from one to ten horsepower in the direct-current types; from one to eleven horsepower, single speed, 3 and 2 phase, and from one to five horsepower, single phase, in the alternating-current types. Three and two-phase, slip-ring type hoist motors are also included from three horsepower up.

The new motors are totally enclosed and all parts are well protected. Bearings are of the waste-packed, sleeve type, being closed against the entrance of dirt from the outside. The direct-current motors are series wound. The alternating-current motors of the polyphase type have high-resistance rotors, while the single-phase motors have an unusually high starting torque.

Dryers Discussed

A recent booklet from the W. E. Prindle Mfg. Company, successors to the Buckeye Dryer Company, describes and illustrates their line of dryers. The type 11 dryer described in this booklet and which is especially suitable for drying sand, gypsum, minerals and ores, is of the counter current type, having the furnace at the discharge end of the cylinder, and with the exhaust fan set at the feed end of the dryer and close coupled,

NEWS OF EQUIPMENT MANUFACTURERS

New Speed Reducer Catalog

The D. O. James Manufacturing Company has recently issued Catalog No. 133, completely describing James Generated Continuous-Tooth Herringbone Gears and Speed Reducers. Detailed description of the various features of Herringbone Gears and Speed Reducers is included, together with complete illustrations of types and installations, and full specifications. It contains complete engineering data, and is a book of real value to all engineers, operating men, and users of heavy duty speed reducing equipment.

New Trackson Distributor

The Allen Equipment Company, 331 S. Rio Grande Avenue, Salt Lake City, Utah, has been appointed the distributor in the Salt Lake territory for Trackson Full Crawlers, manufactured by the Trackson Company, according to an announcement made by that company. Both the Standard Model F and the Heavy Duty Model D Trackson Full Crawlers will be handled by the new distributor, with a complete stock of repair and replacement parts.

New Plymouth Locomotive Diesel Powered Unit

What is believed to be the first Diesel-powered, gear-driven locomotive built in America has just been brought out by the Plymouth Locomotive Works (the Fate-Root-Heath Company). The big saving in fuel cost effected with the Diesel engine is, of course, the main reason for adopting this form of power. The cost of the fuel oil varies from 3 cents per gallon on the Pacific Coast to 6 or 7 cents in the Midwestern States. The engine consumes from 2½ to 3½ gallons per hour, depending on the class of service; and the consumption of lubricating oil is somewhat less than in a gasoline engine of equal power.

The power plant is a 4 cylinder, 4 cycle, enclosed type Atlas-Imperial Full Diesel engine 6½ inch by 8½ inch developing 77 h.p. at a speed of 650 r.p.m. Starting is accomplished by compressed air, and a small combined gas engine and compressor is fitted in the cab for providing starting air. This unit is used for emergency only. The engine has built into it an air compressor that normally supplies all the air necessary for keeping the starting tanks filled.

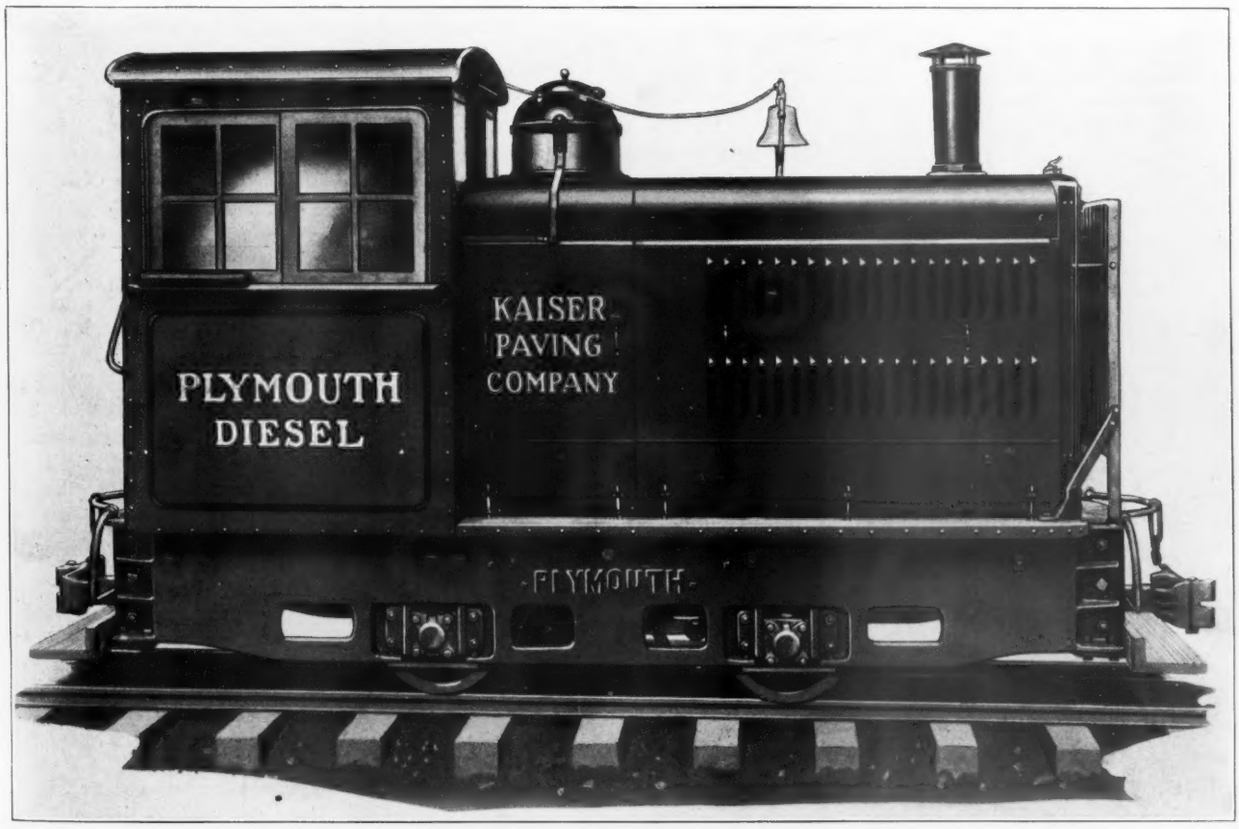
The transmission follows the standard practice of the Plymouth Locomotive Works, with sliding change gears that give four speeds forward and four reverse. A "Twindisc" clutch is mounted on the front end of the transmission driven from the driving disc mounted on the engine crankshaft.

The final drive from transmission to driving axles is by means of two short hardened steel roller chains. A heavy cast-steel frame forms the structure upon which the engine, transmission, cab, etc., are mounted. The side frame members also form the truck frame, having suitable provision for mounting the roller bearing axle boxes.

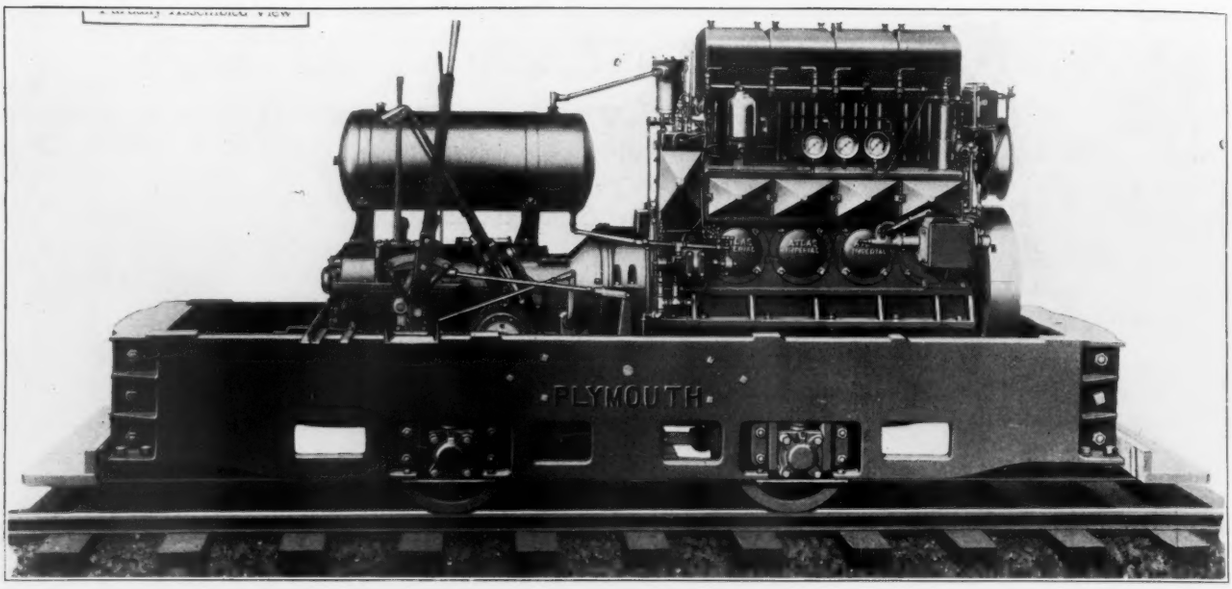
A Modine sectional radiator and a 30 inch, 8-bladed fan driven from the engine provide the necessary cooling. The braking is accomplished by means of hand operated levers, although provision is made for the application of air brakes when required.

The weight of the locomotive ready for the rails is 20,000 pounds and the entire weight comes on the wheels, all of which are drivers. This gives a drawbar pull of 5,000 pounds on dry rails at 2½ miles per hour. Additional speeds of 4, 8¼ and 13½ miles per hour are provided.

The first three of these 10-ton Diesel Locomotives were shipped to



New 10 Ton Plymouth Diesel Locomotive



Showing Interior of New Plymouth Locomotive

the Kaiser Paving Company, Oakland, California, prominent Pacific Coast contractors. One Diesel 10-ton locomotive handled six cars of gravel, total weight of cars and load 144 tons, up a 3 per cent grade at a speed of 8.1 miles per hour. On a test anchored pull the locomotive spun the drive wheels on sanded track in second gear.

One full tank of fuel oil (50 gallons) lasted 16 hours of continuous operation, representing a fuel cost of approximately 10 cents per hour. Plymouth Diesel locomotives will be made in a full range of sizes from 10 ton up to 50 ton, and the larger sizes will soon be in production.

Governors for Speed Control

Governors for automatic speed control of gasoline engines is the subject treated in a new and very attractive booklet issued recently by the Pierce Governor Company.

In the evolution of the modern internal combustion engine from its crude beginning not many years ago, it has become more and more apparent that highest efficiency is largely dependent on uniform speeds. There is no surer way to increase repair bills and maintenance costs than to allow an engine to race at lightning speed when the work is light, and to drag slowly and laboriously when a heavy load is encountered.

The necessity for a dependable governor on all engines used for industrial or stationary power is so thoroughly understood by all, that practically every engine designed for this kind of service has provision for installing a centrifugal governor. Motor transportation developments have produced the so-called "heavy-duty" engine used today, and it has taxed the energy and ingenuity of the engine builders to keep pace with the increased demand for more power, more efficiency and greater durability. These heavy duty engines have their limitations of both power and speed. Up to a certain point speed is an asset to the operation of a commercial vehicle. Beyond that point, speed is a liability.

The intermittent load to which a tractor engine is subjected demands that some automatic device be provided that will enable the engine to maintain a uniform speed, regardless of whether the load is heavy or light. Such a governor effectively prevents the engine from racing when the load is suddenly released, and from stalling when the load is suddenly applied. No tractor can possibly give satisfactory service without a good governor.

A few years ago only steam engines were used for power shovels. With the adaptation of internal combustion engines for this kind of service, the necessity for using an efficient governor was at once apparent. Without a governor the engine labors and stalls when the bucket is shoved into the ground—and races when the load is dumped. Eliminate the governor and gasoline engines could not satisfactorily operate power shovels. Those who have observed air compressors in operation usually find them unattended, running along smoothly while operators of the drills or hammers are often many yards away. A dependable governor makes this possible by keeping the engine running at a uniform speed as the load goes on and off.

In loading machinery extreme load variation compels use of governors on the engines used for loading without a dependable governor the life of such engines would be very short, because of rapid wear that would result from allowing the engine to race every time the load was light. In fact running at high speed would soon wreck the entire machine. The governor is one of the most important items of the loader equipment. All machines subjected to a variable load must be protected by governors if they are to develop their highest efficiency, give the service expected of them, and avoid excessive upkeep costs. Among such machines are included portable and stationary power units, concrete machinery, paving machines, ditchers, hoists, road graders, well drillers, street sweepers, road rollers, electric generator outfits, industrial trucks, lumber carriers, industrial locomotives, gasoline railway cars, etc. On all such machines the use of a cheap governor is poor economy.

New Ajax Bulletin

The Ajax Flexible Coupling Company has recently issued a new general bulletin, completely describing the Ajax Industrial Shock Absorber. This book is complete with illustrations and data, and sets forth admirably the advantages of the Ajax Rubber Bumper Coupling.

C. C. Phelps Moves Office

Charles C. Phelps, combustion engineer has moved his office from Paterson, N. J. to Room 528, 30 Church Street, New York City. He is representative in this district for the Power Plant Equipment Company, Uehling Instrument Company, A. W. Cash Company and Williams Gauge Company.

New Miami Five Ton Trailer

New Miami Five-Ton Trailer

The Miami Trailer Scraper Company have recently added to their line a five-ton, all steel, four wheeled, bottom dump trailer for use with heavy duty tractors. This trailer known as model MD-7 is of rugged construction and the all steel wheels are each equipped with two Timken taper roller bearings which provide fully against end thrust both inward and outward. The fifth-wheel construction is of the full cut-under type, allowing the front wheels to turn completely under the unit even with the bottom doors open, providing an exceptionally short turn radius. In fact, the trailer will turn in its own length.

The trailer is designed for train operation behind heavy duty tractors. For train operation it is necessary to mount an extra hitch connector on the rear of each trailer. The low loading height of the trailer of only 64½ inches from ground to top of body makes this trailer desirable for use under steam shovels, elevating loaders and hand shoveling purposes.

The body of the trailer has a water level capacity of 3 yards and will carry a full rounded load of from 4 to 4½ yards. It is so constructed that the dumping device controls the opening of the bottom doors. This control enables the operator to open the doors six, eight and ten inches as desired for spreading the load as the tractor moves forward. On the other hand the entire load can be dumped instantaneously should this be desired.

The short turning radius makes it extremely popular for use in close and difficult places. The trailer is equipped with French and Hecht all steel wheels. The same chassis is also furnished with a stake platform body for general hauling purposes. The chassis construction is the same as on the dump trailer giving the platform body trailer the short turning radius. The platform body trailer may also be operated in trains behind the heavy duty tractors.

First New 20 Ton Davenport Locomotive Shipped

The first of the 20-ton double truck series of the Davenport gas-electric industrial locomotives, being manufactured by the Davenport Locomotive and Manufacturing Corporation, was shipped October 5 to Winnipeg, Canada, where it will be used by the city of Winnipeg Hydro Electric System. The new locomotive is similar in construction to the 25 and 30-ton models which are being built by the Davenport company.

Equipment used in building this locomotive was the most modern, such as shutters on radiators, for extreme weather conditions, snow plow, special arrangement of cab, with its lighting, ventilating and hot water heating systems, air sanders, straight and automatic air brakes, power take-off for direct current up to 240 volts, for lighting, heating, cooking, operating electric motors, windlass, pumps, etc. This locomotive has been built to maintain a schedule of 25 miles per hour over heavy grades and at temperatures varying from 47 degrees Fahrenheit below zero to 110 degrees above.

The City of Winnipeg Hydro Electric System is a municipally owned company which supplies electrical power direct to the city of Winnipeg and furnishes wholesale power to all portions of the Province of Manitoba. "We expect to do with this locomotive most of the work that we have been doing with a 75-ton steam locomotive, keeping the large steam locomotive in reserve for any excessive hauling operations," Mr. Wylde said. The gas-electric locomotive will be used for freight and passenger service from the end of the Canadian Pacific Railroad at Lac du Bonnett through a dense forest for 25½ miles to the power plant on the Winnipeg River, known as Point du Bois. All material and supplies will be handled in by means of the gas-electric locomotive and the only passenger service in this 25-mile region will be furnished by the same agency.

New Laboratory Screen

To enable laboratories requiring material sizing devices which will give accurate and uniform results to obtain quick results, the Traylor Vibrator Company has recently put on the market the "Vibrote" laboratory screen. It has two motions from one source of power with a reciprocating action and eliminates the costly loss of time in testing as it gives positive separation and is so compact as to make practical field test as well as those in the laboratory.

It is quiet in operation, inexpensive, and has no wearing parts. Rubber cushions confine the vibration to the screen and abrasive material and dust do not effect the vibration. It is claimed that this screen will accurately complete tests in approximately half the time required by the average laboratory screen. The machine will accommodate six full-size or twelve half-size sieves and weighs but fifty pounds.

Mundy Appoints

The Mundy Sales Corporation announces the appointment of the Milburn Machinery Company, Columbus, Ohio, as exclusive agents for Mundy products, including the new patent three speed hoist, for central Ohio.

Scoop of New Design

A new Speeder skimmer scoop with three exclusive features has recently been placed on the market by the Speeder Machinery Corporation. The Speeder skimmer scoop features a high and low speed on the drums as well as on traction, a patented bucket trip, a traction lock and a bucket that dumps from the back instead of the bottom.

New Speeder Unit

The back-dump feature, which is made possible by placing the pivots near the top of the bucket instead of the bottom, gives a dumping clearance greater than could be obtained with a bottom dump, which is very desirable in certain classes of work and adds to the life of the bucket by eliminating the hinge on the bottom, which carries the greatest load. The Speeder skimmer scoop embodies all the other Speeder features and change to the skimmer from any other Speeder attachment is accomplished by simply changing the boom and reweaving the cables. It is full revolving, giving a wide working range and permitting wagons and trucks to be loaded from the rear.

A six-foot turn-table and extra large caterpillar base gives sufficient stability for the use of an 18 foot boom enabling the bucket to fill on very shallow cuts and giving an added height to the dumping clearance. A center quill, six inches in diameter, along with sturdy construction throughout the whole machine, enables the Speeder to successfully absorb the shock which is necessarily thrown upon any full circle machine when it is used as a skimmer.

Power Shovels Described

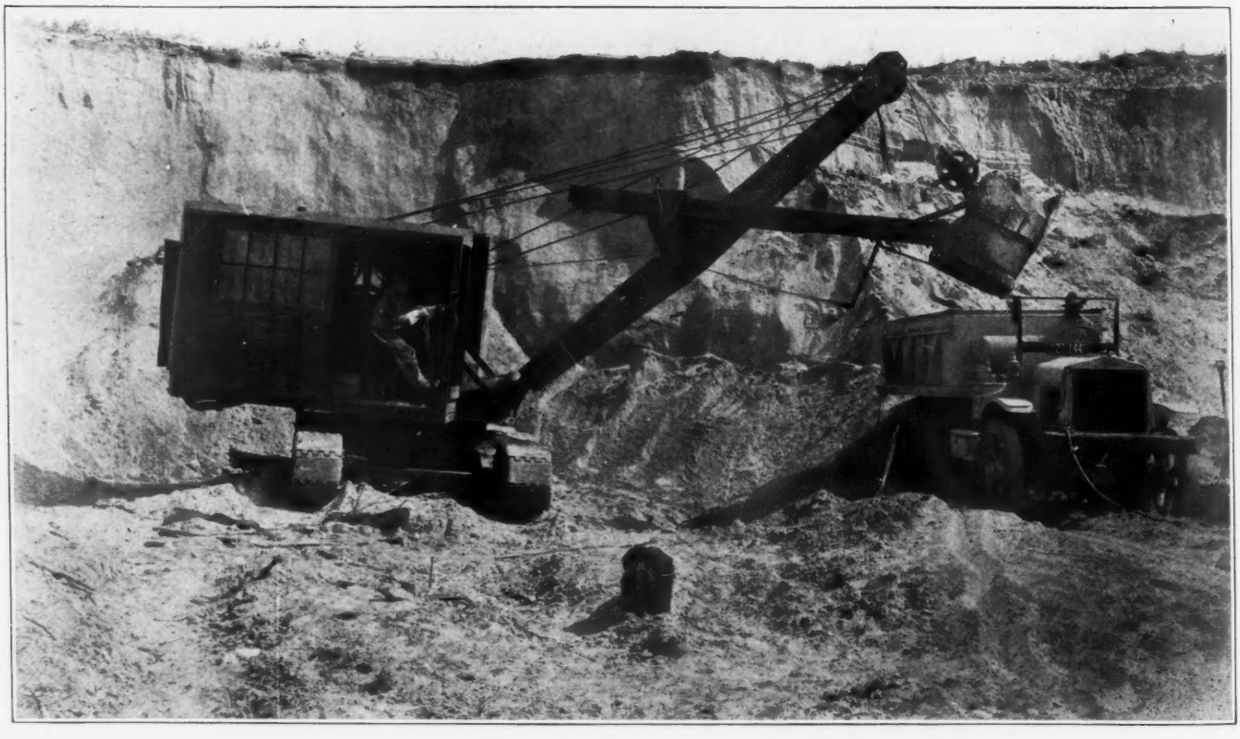
The Universal Power Shovel Company describes the latest developments in its product in a well printed and profusely illustrated booklet, recently issued. The Wilford line, manufactured by this company, now includes shovel, trench hoe, clamshell, crane, dragline and backfiller, the power for these units being supplied by a Fordson tractor, equipped with governor. A more complete description of the product has appeared in past issues of Pit and Quarry.

An Active Digger

A new shovel-crane, called "The American Gopher," is one of the latest additions to the line of shovels, cranes, derricks, etc., manufactured by the American Hoist and Derrick Company.

This shovel-crane contains fewer parts than is usual in machines of this character and combines speed with adaptability and ruggedness. It is equipped with continuous chain treads, which enables it to travel over all types of ground, from mud to soft sand. The treads are flat and do not harm pavement while traveling over city streets. There are holes in the treads so that cleats can be applied when it is necessary for the machine to travel over slippery places.

This new shovel-crane is equipped with high pressure lubrication, S. K. F. bearings and parts are interchangeable wherever possible. In order to meet the demand for various kinds of power this shovel-crane comes equipped for either gasoline, Diesel power, or electric.



New American Shovel Crane

MEN OF THE INDUSTRY

The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.

J. E. CARROLL

Mr. Carroll is Vice President, Treasurer and Purchasing Agent of the Carroll Sand Company of Buffalo, N. Y.